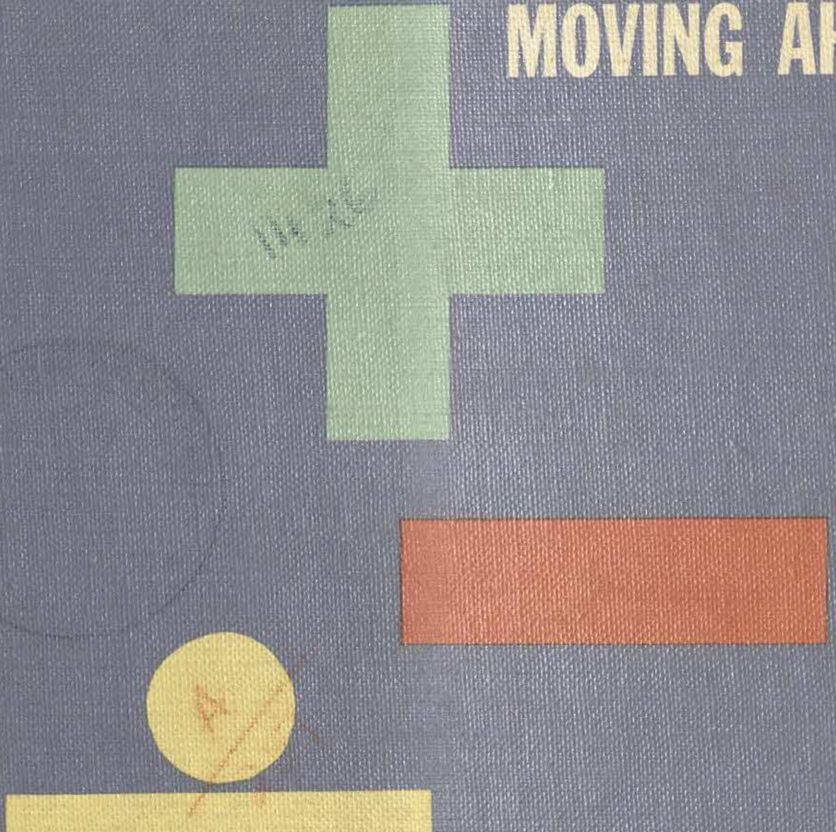
MOVING AHEAD



TEACHER'S EDITION — ANNOTATED AND KEYED

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How to Use the TEACHER'S EDITION—Annotated and Keyed

FOR

AMERICAN ARITHMETIC

SECOND EDITION

This Teacher's Edition is designed to be the greatest possible help to the busy teacher. Within one cover, it presents these distinctive features.

1. Pupil's Book. The full text of the pupil's book is printed in black and color exactly as it appears in the book used by the pupil.

2. Annotation. Concise statements of objectives and practical and helpful suggestions to the teacher are overprinted in a distinctive and legible color directly on the pages of the pupil's text.

3. Answers and Keys. Answers to all concrete problems are overprinted in color on the pages of the pupil's text. They are placed in the normal positions or as near to the problem as possible. There is no need for the teacher to work these problems or to turn to an answer section.

The keys to the more involved problems with their answers are given in the Teacher's Guide and Key at the end of the book.

4. Teacher's Guide and Key. For the convenience of the teacher, the Teacher's Guide and Key is printed on tinted paper immediately following the index in the pupil's text. The tinted paper is different enough from the white paper of the pupil's text to assist the teacher in turning easily to guide or key pages. A tint has been used that has been found scientifically easy on the eyes. The pages of the Teacher's Guide and Key are numbered separately with the letter G pointing out that guide and key pages are meant.

The Teacher's Guide and Key provides a full statement of the aims and detailed practical suggestions for each chapter and each page or group of pages in the pupil's text. Following the discussion of the treatment of each page is the key, working the more involved problems in full. References to pages in the workbook AMERICAN WORKSHOP are provided for those teachers using these workbooks. A list of audio-visual aids is provided at the end of the guide.

For advance study in preparation for the class session and for quick reference in the classroom, the Teacher's Edition—Annotated and Keyed offers the teacher all the above in this one volume, very little larger than the pupil's text itself.

MOVING AHEAD

American Arithmetic
Second Edition

254
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EP 10 9 8 7 6 5 4 3 2 1

TEACHER'S EDITION-Annotated and Keyed
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Before beginning the work in this text, study carefully the "Suggestions to Teachers," pages 327-329, and the Introduction to the Teacher's Guide. These suggestions and remarks should help you plan for the most effective use of the text.

Teach or reteach basic understandings and fundamental skills. See Teacher's Guide and Key for the aims of Chapter 1.

Provide experiences in rational and rote counting. Reinforce by letting pupils take attendance, count supplies, and so on.

Chapter 1

At School

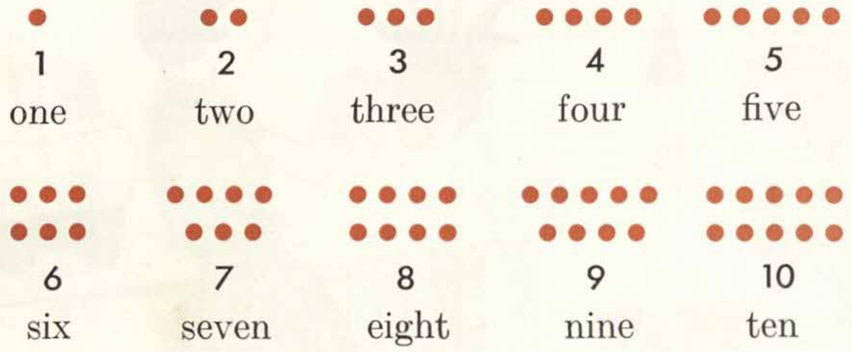
1. How many children do you see in all? 9*
2. How many girls do you see? 4 How many boys? 5
3. How many children are sitting down? 6
4. How many children are reading? 3
5. How many girls are reading? 1 How many boys? 2
6. Can you count higher than 9? Try to count all the children in your room at school.
7. Count the girls in your room at school.
8. Count the boys in your room.
9. Are there more girls than boys in your room?
10. Tell the numbers from 1 to 10. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

*Due to limitations of space, only the numerical part of an answer is shown in the annotation throughout the text. Pupils should, however, give complete answers and process steps, as shown in the Teacher's Guide and Key for each page.

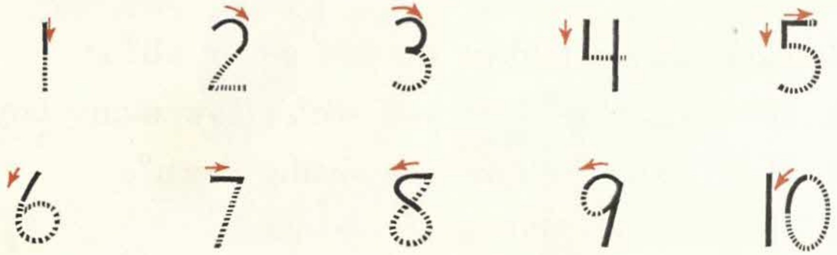
Check knowledge of number names and numerals that describe groups. Provide practice in writing numerals correctly.

Numbers 1 to 10

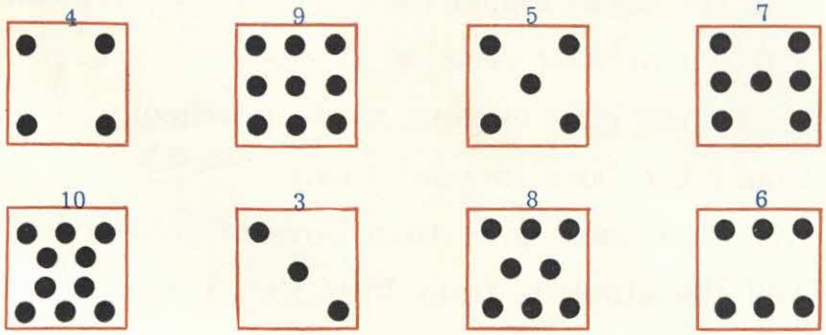
1. Here are the numbers from 1 to 10 with their number names. Read them: Make flash cards similar to these.



2. Look at the numbers below. See how to write them. Write them on your paper. The red arrow shows where to start each number: Stress.



3. Tell how many dots there are in each box:

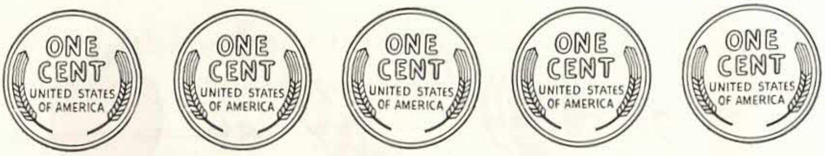


Be sure pupils can quickly recognize number groups in other patterns and forms, such as triangles, lines, and squares. Make patterns on cards to provide practice in recognition of groups, number names, and numerals.

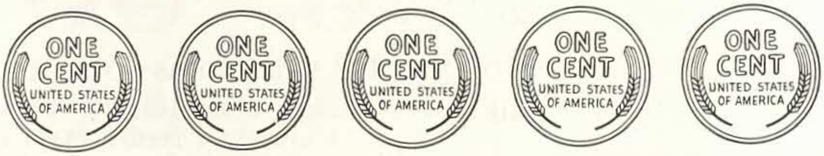
Discuss meanings and equivalences of cent, nickel, and dime. Review meaning and use of ¢ sign.

Learning about Money

A



B



1. Count the pennies in row A. Count them in row B. How many are there in rows A and B together? 10

2. Another name for penny is **cent.** How many cents are there in rows A and B together? 10

A Nickel
5 cents

3. Jack has a nickel. He says that 5 cents or 1 nickel will buy a new pencil. 5 cents make 1 nickel. You see a picture of a nickel here.

4. The sign ¢ means cent or cents. You can write 5 cents like this: 5¢.

A Dime
10 cents

5. Ann has a dime. She says that 10 cents or 1 dime will buy a balloon. 10 cents make 1 dime. You write 10 cents like this: 10¢. Look at the dime shown at the right.

6. Can you tell how many nickels make 1 dime?

7. Remember this: Stress.

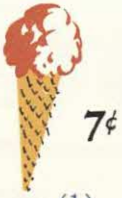
5¢ make 1 nickel.
10¢ make 1 dime.
2 nickels make 1 dime.

8. Pennies, nickels, and dimes are called **coins.** Emphasize.

Be sure pupils understand meanings of coin and cent. Discuss and begin class posters on "What a Nickel Will Buy" or "What a Dime Will Buy." See Guide page 9 for procedure.

Clarify the meanings of "comes after," "comes before," "more than," "next," and "smallest." Extend knowledge of coins.

More about Money



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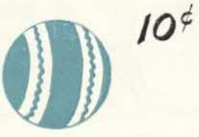

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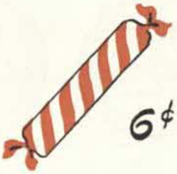

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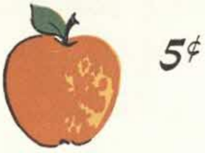


(4)

1. Look at the pictures and tell what coins you could use to buy each thing. *(1) 1 nickel, 2 pennies; (2) 1 dime; (3) 1 nickel, 1 penny; (4) 1 nickel

2. Name the coins you could give to pay for each of these things: *

a 7-cent ball ← 1 nickel, 2 pennies   a 5-cent rabbit 1 nickel
a 9-cent duck ← 1 nickel, 4 pennies   a 3-cent cookie 3 pennies
a 4-cent apple ← 4 pennies   a 10-cent toy 1 dime

3. Read these: 9¢, 5¢, 2¢, 6¢, 10¢, 7¢, 4¢.

4. Use play coins and buy things that cost these numbers of cents: 3¢, 10¢, 8¢, 1¢, 9¢, 7¢.

Do You Know the Numbers?

5. What number comes after 8? 9 after 3? 4 after 6? 7

6. What number comes before 5? 4 before 7? 6

7. What number is 1 more than 7? 8 1 more than 2? 3

8. How old are you now? Write the number.

9. How old will you be next year? Write it.

10. Write these numbers in order. Begin with the smallest number:

7 2 9 5 1 4 8 3 6

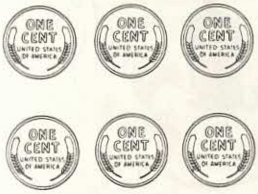
11. Count your pencils. Count your books.

*Answers may vary. Let pupils tell of recent monetary experiences, illustrating with large display coins. Other pupils may follow story with play coins at desk. If needed, extend review in ex. 5-10 with number cards or number line. Ask similar questions.

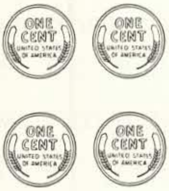
Prepare for addition stories on page 6. Check understandings of "most" and "together."

Groups of Pennies

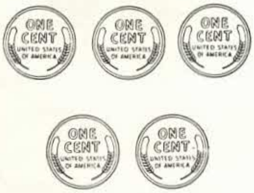
1. Each child has some pennies. Look at them and tell how many pennies each one has.



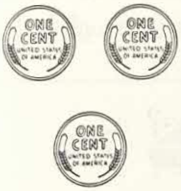
Tom 6¢



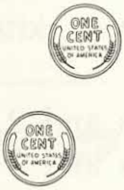
Ann 4¢



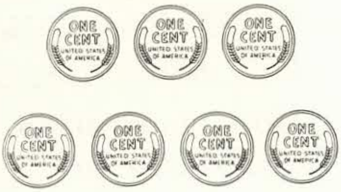
Jim 5¢



Betty 3¢



Mary 2¢



Bob 7¢

2. Which child has a group of 6 pennies? Tom

3. Which child has a group of 3 pennies? Betty

4. Which one has a group of 5 pennies? Jim

5. Which group has the most pennies in it? Bob's group

6. Does Tom have more pennies than Mary? Yes

7. Does Ann have more pennies than Jim? No

8. Which child has a group of 4 pennies? Ann

9. Does Bob have more pennies than Mary? Yes

10. Does Betty have more pennies than Jim? No

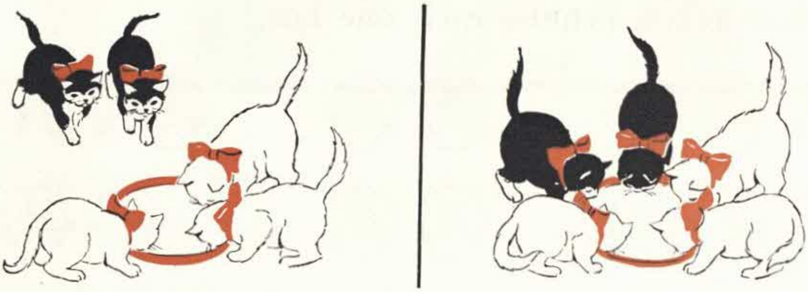
11. Does any child have a group of 9 pennies? No

12. How many pennies have Tom and Ann together? 10

Reinforce meanings through comparisons of objects (books, pencils, counters) and children (boys and girls, rows, reading groups) in class. Ask pupils questions about largest group, which has more, and so on.

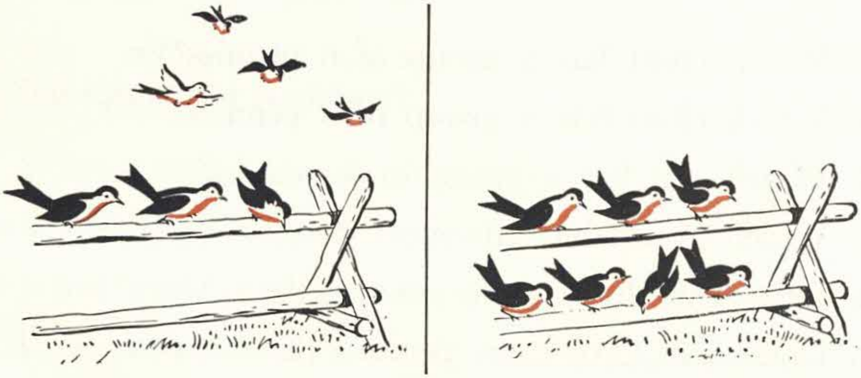
Dramatize the two number stories on this page, using real objects or a flannel board. Emphasize the joining action.

Joining Groups



1. Three kittens were drinking milk. Two more kittens joined them. How many kittens were drinking milk then? 5

How many are 3 kittens and 2 kittens? 5
How many are 2 kittens and 3 kittens? 5



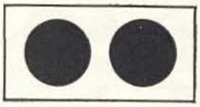
2. Three birds were on a fence. Four more birds flew down to join them. How many birds were on the fence then? 7

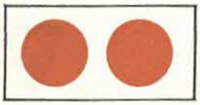
How many are 3 birds and 4 birds? 7
How many are 4 birds and 3 birds? 7

Have pupils summarize the addition stories in both vertical and horizontal forms. Have them demonstrate with counters how groups are joined together in addition. Remind pupils that counters represent real objects.

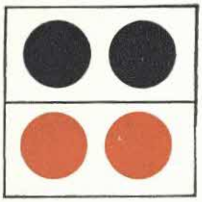
Demonstrate with objects how the groups are put together. Encourage pupil participation in doing this.

Putting Groups Together





1. How many circles above are black? 2
   How many circles above are red? 2
   If we put the two groups together, how many circles are there in all? 4 →



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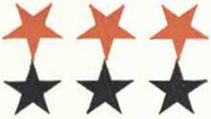
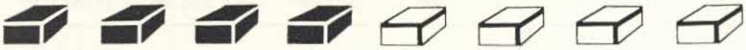
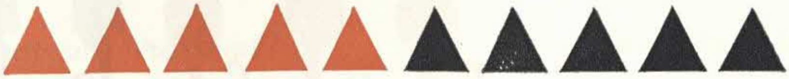
2. How many stars are red? 3
   How many stars are black? 3
   How many stars are there in all? 6





3. How many boxes are black? 4
   How many boxes are white? 4
   How many boxes are there all together? 8



4. How many triangles are red? 5
   How many triangles are black? 5
   How many triangles are there all together? 10

When you join groups or put groups together, the best way to find how many there are in all is to add.

Make up stories for pupils to dramatize, using these addition facts. Help the pupils discover that the order in which two groups are put together makes no difference in the sum. The sum may be found by counting or recognizing known groups.

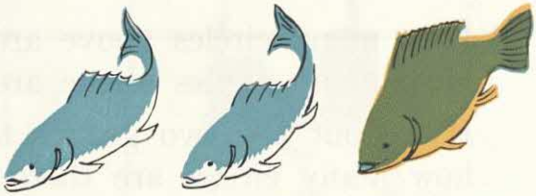
Continue to illustrate and dramatize addition facts using appropriate materials.

Do You Remember These Addition Facts?

1. 1 and 1 are . . 2.

2. 2 and 1 are . . 3.

3. 1 and 2 are . . 3.



4. 3 and 1 are . . 4.

5. 1 and 3 are . . 4.

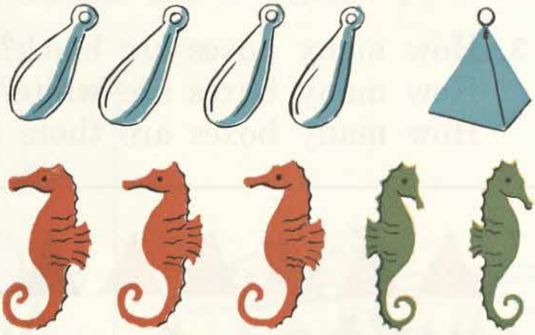
6. 2 and 2 are . . 4.

7. 4 and 1 are . . 5.

8. 1 and 4 are . . 5.

9. 3 and 2 are . . 5.

10. 2 and 3 are . . 5.



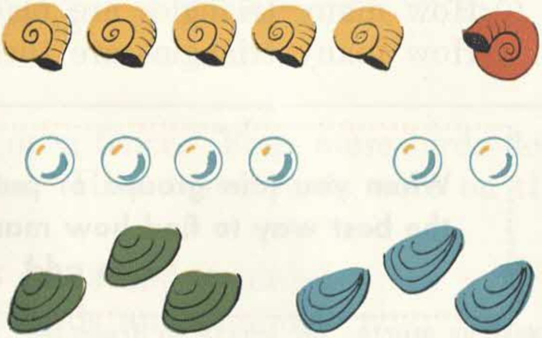
11. 5 and 1 are . . 6.

12. 1 and 5 are . . 6.

13. 4 and 2 are . . 6.

14. 2 and 4 are . . 6.

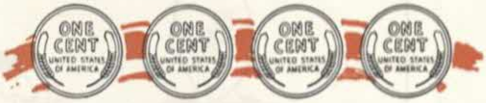
15. 3 and 3 are . . 6.



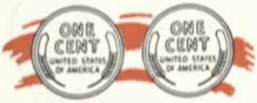
Have pupils demonstrate the addition facts by using representative materials or by drawing dots, circles, triangles, and so forth. Ask them to show with their materials or drawings that the sums are correct. See pages 6-7 for other suggestions.

Develop the meaning of the words "add," "sum," "addition fact," "and," "plus," "are," and "equals."

Adding Numbers



Jim's Pennies



Bill's Pennies

1. How many pennies has Jim?4 How many pennies has Bill?2 How many pennies do the boys have in all?6 4 pennies and 2 pennies are how many pennies?6

When you find that 4 pennies and 2 pennies are 6 pennies, you are **adding.** You **add** 4 and 2 to get 6. See how it is written on the right. We call 6 the **sum.** This is called an **addition example** or an **addition fact.**

$$\begin{array}{r}4\\+2\\\hline 6\end{array}$$

2. Another way to write that "4 and 2 are 6" is this way:

$$4 + 2 = 6$$

Emphasize these symbols and words.

The sign + means **and.** It tells you to **add.**
The sign = means **are** or **is.**

What are the sums?

3.	4	2	1	3	1	1	2	1	2
	1	3	1	2	4	2	1	3	4
	5	5	2	5	5	3	3	4	6
4.	1	4	2	3	5	3	2	2	1
	5	2	2	3	1	2	4	3	5
	6	6	4	6	6	5	6	5	6

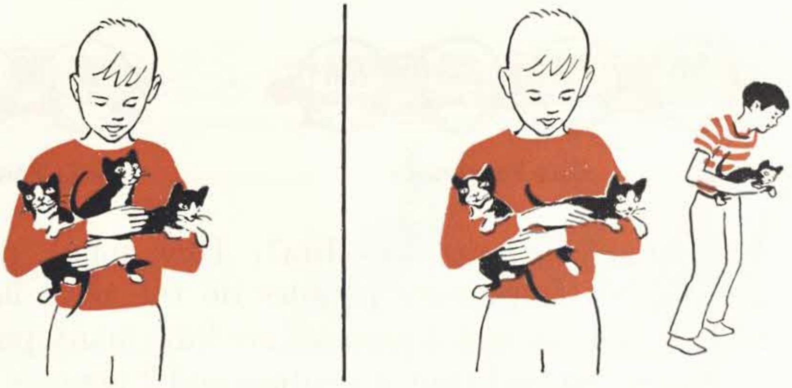
5. 3 + 3 = 6. .   2 + 2 = 4. .   4 + 2 = 6. .

6. 1 + 4 = 5. .   5 + 1 = 6. .   1 + 3 = 4. .

Begin making an arithmetic vocabulary chart. Show the meaning of new words and symbols on the chart, as in ex. 2. Refer to it frequently. Lead the pupils to see that horizontal and vertical forms tell the same addition story.

Have pupils dramatize and explain how groups are decreased in size in subtraction. The take away concept is developed here.

Taking Things Away



1. Jim had 3 kittens. He gave 1 kitten to Bill. How many kittens did Jim have left? 2

2. Mary's 4 dolls were in a big chair. Mary took away 1 doll. How many dolls were left in the chair? 3

3. Put 6 books on the table. Now take away 3 books. How many books are left on the table? 3

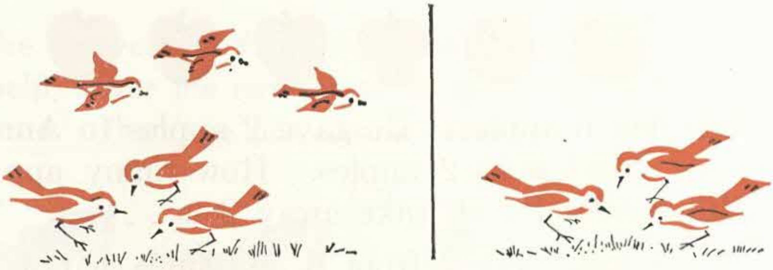
4. Put 6 pencils on the table. Now take away 5 pencils. How many pencils are left on the table? 1

5. Draw 5 dots on a paper. Take away 3 dots. Put your hand over them. How many dots are left? 2

6. Put 5 pennies on the table. Give 2 pennies to a friend. How many pennies are left on the table? 3

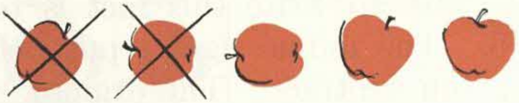
Let pupils perform the actions suggested in ex. 3-6. Have them also make drawings to illustrate the subtraction facts, crossing out or covering up the group taken away. The answer may be obtained by counting or by recognition.

Taking Things Away

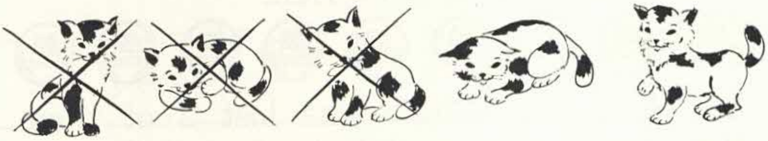


1. The picture at the left shows 6 birds. 3 birds are on the grass and 3 birds are flying away. In the picture at the right, 3 birds are gone. How many birds are left? 3 6 take away 3 is $\overset{3}{\ldots}$.

2. Here are 5 apples. Jack eats 2 apples. The lines across 2 apples show that these apples are gone. How many apples are left? 3 5 take away 2 is $\overset{3}{\ldots}$.



3. Tom has 5 kittens. He gives away 3 kittens. The lines across 3 kittens show that Tom gave away 3 kittens. How many kittens are left? 2



4. Ann had 6 pencils. She gave 2 pencils to Bill. How many pencils does Ann have left? 4 Put 6 pencils on the table to show how many Ann had. Then take away 2 pencils. How many pencils are left? 4

5. Peter had 10 pennies. Then he spent 3 pennies. How many pennies has Peter left? 7 Use 10 real pennies or 10 play pennies to find the answer.

Encourage pupils to show the relationships between corresponding addition and subtraction facts. Have them write the facts in both horizontal and vertical forms. Stress the proper use of words to describe addition and subtraction ideas.

Teach the meaning of the words "subtracting," "minus," "subtract," "take away," and "subtraction fact."

How Many Are Left?

1. Bill had 6 apples. He gave 2 apples to Ann. Put your hand over 2 apples. How many apples did Bill have left? 4 6 take away 2 is . . 4.

2. When you take 2 from 6 and find that 4 is left, you are **subtracting.** You can write the subtraction example this way: $6 - 2 = 4$
The sign − is called the **minus** sign. It means **take away** or **subtract.** $6 - 4 = 2$ is called a **subtraction example** or a **subtraction fact.**

Emphasize the new words in Ex. 2.

3. Another way to write this fact is to put 2 under 6. The minus sign is put before the number you subtract. The example is read, "6 take away 2 is 4" or "2 from 6 is 4."

$$\begin{array}{r} 6 \\ -2 \\ \hline 4 \end{array}$$

Stress proper placement of the minus sign.

Use these pennies to help you find the answers to the number stories below: In Ex. 4-6 point out how numbers from problems are written, as on the right.

4. Ann had 9 pennies. She lost 2 of them. How many pennies did she have left? 7

$$\begin{array}{r} 9 \\ -2 \\ \hline \end{array}$$

5. Jim had 9 pennies. He spent 5 pennies. How many pennies did he have left? 4

$$\begin{array}{r} 9 \\ -5 \\ \hline \end{array}$$

6. Jack had 9 pennies. He put 7 pennies in his bank. How many pennies did Jack have left in his pocket? $9 - 7 = . .$ 2

Stress.

To find how many are left, you subtract.

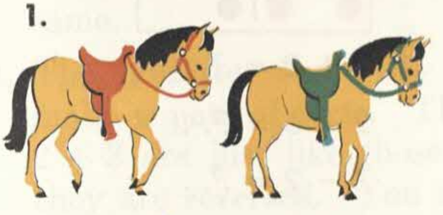
Lead pupils to see that the generalization above is correct. Discuss the new terminology introduced on this page and add it to the vocabulary chart referred to on page 9. Have the pupils state other subtraction problems and solve them.

Observe whether the pupils understand the subtraction concept by properly covering the groups that are taken away.

Do You Remember These Subtraction Facts?

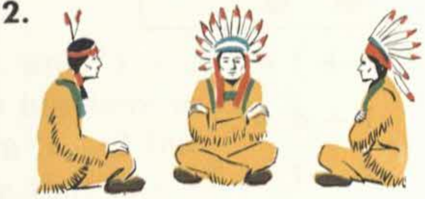
Give the answers to these subtraction examples. If you need help, cover the number of things in the picture to be subtracted. Then see how many remain.

1.



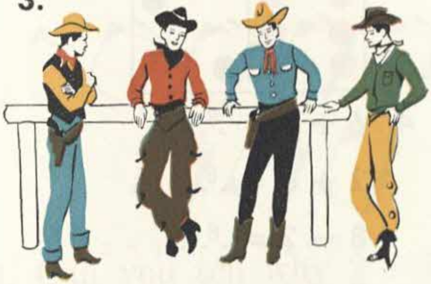
2 − 1 = ..1.

2.



3 − 1 = ..2. 3 − 2 = ..1.

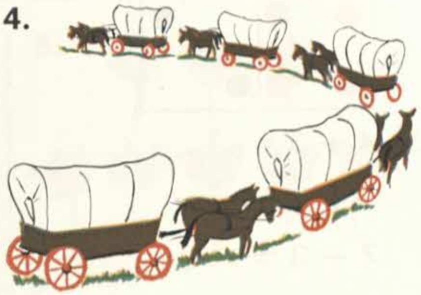
3.



4 − 1 = ..3. 4 − 2 = ..2.

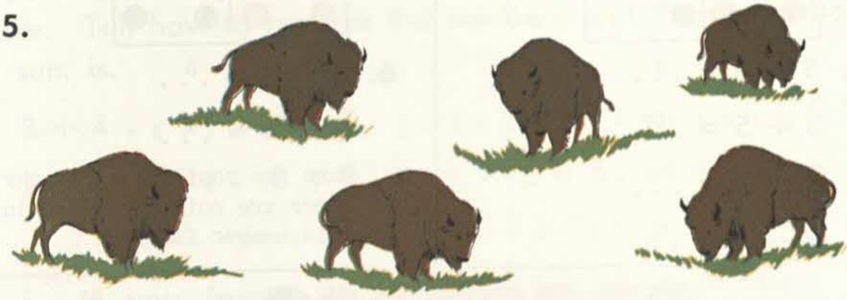
4 − 3 = ..1.

4.



$$\begin{array}{rrrr} 5 & 5 & 5 & 5 \\ -1 & -4 & -2 & -3 \\ \hline 4 & 1 & 3 & 2 \end{array}$$

5.



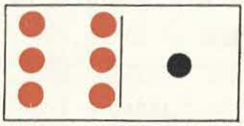
$$\begin{array}{rrrrr} 6 & 6 & 6 & 6 & 6 \\ -1 & -5 & -2 & -4 & -3 \\ \hline 5 & 1 & 4 & 2 & 3 \end{array}$$

Have the pupils write the number sentences in ex. 1-3 in vertical form and the number facts in ex. 4-5 in horizontal form. Have them also give the corresponding addition sentence for each subtraction sentence, e.g., 4 − 1 = 3, 3 + 1 = 4.

Develop the relationships among the facts in each number family. Assist the pupils in reading the instructions on the page.

Do You Remember These Number Facts?

Study the pictures only if you need help. To subtract, cover the group taken away. Then see how many are left.

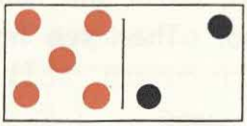


1. 6 + 1 = .7.

1 + 6 = .7.

7 − 1 = .6.

7 − 6 = .1.

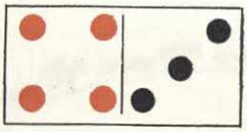


2. 5 + 2 = .7.

2 + 5 = .7.

7 − 2 = .5.

7 − 5 = .2.

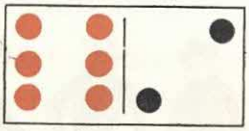


3. 4 + 3 = .7.

3 + 4 = .7.

7 − 3 = .4.

7 − 4 = .3.

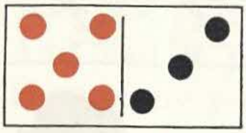


4. 6 + 2 = .8.

2 + 6 = .8.

8 − 2 = .6.

8 − 6 = .2.

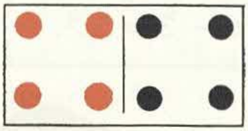


5. 5 + 3 = .8.

3 + 5 = .8.

8 − 3 = .5.

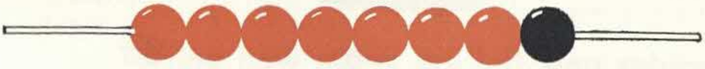
8 − 5 = .3.



6. 4 + 4 = .8.

8 − 4 = .4.

Have the pupils explain why there are only two facts in this number family.



7. 7 + 1 = .8. 1 + 7 = .8. 8 − 1 = .7. 8 − 7 = .1.

Some children can probably work quite satisfactorily from the pictures on the page, while others will profit greatly by working with counters at their seats. Have pupils illustrate their discoveries on a flannel or magnetic board.

Illustrate with objective materials that reversing the order of two numbers does not affect their sum.

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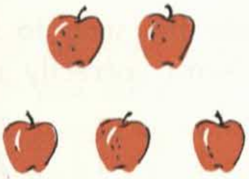
How to Help Yourself



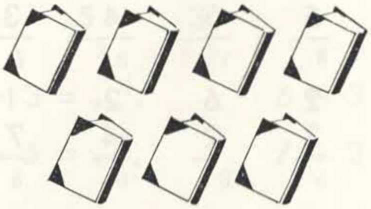
1. How many are 2 apples and 3 apples? 5 How many are 3 apples and 2 apples? 5 You see that both the sums are the same.

2. The addition facts 2 + 3 and 3 + 2 make a **pair of facts.** The numbers in 2 + 3 are just like those in 3 + 2 but they are **reversed.** You see that 2 + 3 and 3 + 2 both have the same sum: 5.

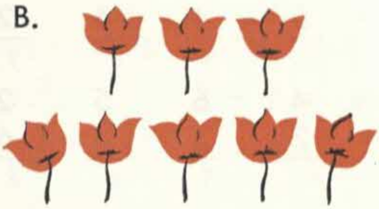
$$\begin{array}{r} 2 \\ +3 \\ \hline 5 \end{array} \qquad \begin{array}{r} 3 \\ +2 \\ \hline 5 \end{array}$$

3. Tell the pair of addition facts that each picture shows:

A.



B.



4 + 3 = 7 3 + 4 = 7 3 + 5 = 8 5 + 3 = 8

4. Can you tell why 2 + 5 = 5 + 2?
Hint: Does 2 + 5 = 7? Yes Does 5 + 2 = 7? Yes
Then why does 2 + 5 = 5 + 2? Both pairs of numbers have the same sum.

Suppose you forget the sum of the numbers in each fact below. Tell how to reverse the numbers and then tell what the sum is.

5. 3 + 4 = 4 + 3 = 7 4 + 2 = 2 + 4 = 6 1 + 7 = 7 + 1 = 8 2 + 3 = 3 + 2 =
6. 2 + 5 = 5 + 2 = 7 5 + 3 = 3 + 5 = 8 2 + 6 = 6 + 2 = 8 6 + 1 = 1 + 6 =

Stress.

If you forget an addition fact, reverse the numbers. Then try to add them.

Let the pupils, using counters at their seats, discover for themselves that the sum of a group of 2 and a group of 3 is precisely the same as the sum of a group of 3 and a group of 2. Have the pupils make up story problems to illustrate ex. 5-6.

Test mastery of these simpler addition facts taught in Grades 1 and 2 and reviewed on the preceding pages.

Have You Learned These Addition Facts?

Write the sums to these additions on your paper. Be sure to learn correctly any facts that you miss.

1.	1	2	1	2	3	1	4	1	5
	1	1	2	2	1	3	1	4	1
	2	3	3	4	4	4	5	5	6
2.	1	2	3	2	3	1	1	2	6
	5	3	2	4	3	6	7	6	1
	6	5	5	6	6	7	8	8	7
3.	4	5	4	3	2	7	6	4	5
	2	2	3	4	5	1	2	3	3
	6	7	7	7	7	8	8	7	8
4.	3	3	4	5	3	2	4	3	2
	5	4	4	2	5	5	4	3	6
	8	7	8	7	8	7	8	6	8
5.	4	6	5	2	2	6	2	1	7
	2	1	3	6	3	2	4	7	1
	6	7	8	8	5	8	6	8	8

Give the answers to these number stories:

6. Jim had 5¢. Then he found 2¢. Now Jim has .7. . cents in all.

7. Susan had 6 books. She bought 1 book today. Now Susan has .7. . books.

8. Jack has 3 candies. Bob has 3 candies, too. Together the boys have .6. . candies.

9. Billy has 2 dogs and 3 kittens. Billy has .5. . pets all together.

10. Tell a number story about each of the addition facts in row 5 above. Ask a friend to tell you the answers.

Have those pupils needing practice on addition facts work with partners, using flash cards to speed up their responses. If commercially prepared flash cards are not available, have the pupils make their own. See that they use them regularly.

Test mastery of these simpler subtraction facts taught in Grades 1 and 2 and reviewed on the preceding pages.

Have You Learned These Subtraction Facts?

Write the answers to these subtractions on your paper. Be sure to learn correctly any facts that you miss.

1.	2	3	3	4	4	4	5	5
	1	1	2	1	3	2	1	4
	1	2	1	3	1	2	4	1
2.	5	5	6	6	6	6	6	7
	2	3	1	5	2	3	4	1
	3	2	5	1	4	3	2	6
3.	7	7	7	7	7	8	8	8
	6	2	3	5	4	1	2	7
	1	5	4	2	3	7	6	1
4.	8	8	8	8	7	8	6	7
	6	5	3	4	5	6	4	4
	2	3	5	4	2	2	2	3

5. 7 − 3 = ... 4 6 − 3 = ... 3 8 − 4 = ... 4

6. 8 − 5 = ... 3 7 − 2 = ... 5 8 − 2 = ... 6

Give the answers to these number stories:

7. There were 6 children playing a game in the park. Then 2 children went home. How many children were left to play the game? 4

8. Sally picked 8 flowers in her garden. She gave her mother 5 flowers. How many did Sally have left? 3

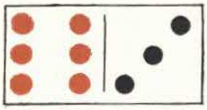
9. Jack saw 4 rabbits. 2 rabbits ran away. How many rabbits were left? 2

10. Jim saw 7 birds on the grass. Then 2 birds flew away. How many birds were left? 5

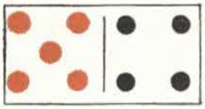
Stress the relationships among the facts in these number families. Have pupils illustrate them with objective materials.

Do You Remember These Number Facts?

Study the pictures only if you need help. To subtract, cover the group taken away. Then see how many are left.



1. 6 + 3 = . . . 9
3 + 6 = . . . 9
9 − 3 = . . . 6
9 − 6 = . . . 3



2. 5 + 4 = . . . 9
4 + 5 = . . . 9
9 − 4 = . . . 5
9 − 5 = . . . 4

3. 8 + 1 = . . . 9
1 + 8 = . . . 9
9 − 1 = . . . 8
9 − 8 = . . . 1

4. 7 + 2 = . . . 9
2 + 7 = . . . 9
9 − 2 = . . . 7
9 − 7 = . . . 2

5.	8	7	6	5	4	3	2	1
	+1	+2	+3	+4	+5	+6	+7	+8
	9	9	9	9	9	9	9	9
6.	9	9	9	9	9	9	9	9
	−1	−8	−7	−2	−3	−6	−5	−4
	8	1	2	7	6	3	4	5
7.	6	9	6	8	5	9	7	9
	+2	−5	+3	−6	+4	−3	+2	−4
	8	4	9	2	9	6	9	5

Urge those who can work without counters to do so. Lead the pupils to see other relationships among number facts, e.g., 8 + 1 = (7 + 1) + 1 = 7 + (1 + 1) = 7 + 2.

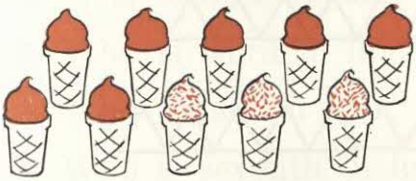
Continue to stress relationships among facts in number families. Have pupils make up story problems to illustrate the facts.

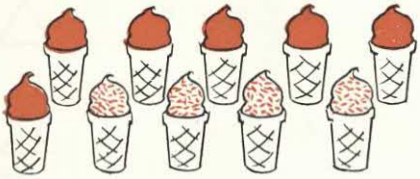
Do You Remember These Number Facts?

Study the pictures only if you need help. To subtract, cover the group taken away. Then see how many are left.

1. 9 + 1 = . 10.
1 + 9 = . 10.
10 − 1 = . . 9.
10 − 9 = . . 1.

2. 8 + 2 = . 10.
2 + 8 = . 10.
10 − 2 = . . 8.
10 − 8 = . . 2.

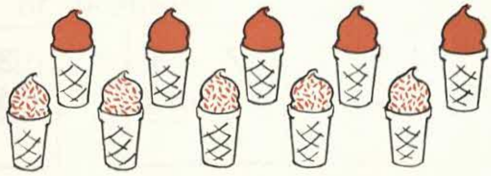




3. 7 + 3 = . 10.
3 + 7 = . 10.
10 − 3 = . . 7.
10 − 7 = . . 3.

4. 6 + 4 = . 10.
4 + 6 = . 10.
10 − 4 = . . 6.
10 − 6 = . . 4.

5. 5 + 5 = . 10.
10 − 5 = . . 5.



6.

4	5	3	3	10	10	10	10
+5	+5	+6	+7	−5	−4	−8	−7
9	10	9	10	5	6	2	3

Provide practice in reasoning by having pupils complete such sentences as "Since 4 + 4 = 8, then 4 + 5 = ____." Knowing how to relate an unknown to a known fact is an essential skill.

Encourage pupils to "think" addition facts by relating an unknown to a known addition fact that is about the same.

Help with Addition Facts

Debby: "How much are 4 and 5? I can find out by counting on my fingers but that is too slow."

Jane: "Why don't you learn to 'think' the sum in your mind the way I do? It's easy and quick."

Debby: "How do you do that?"

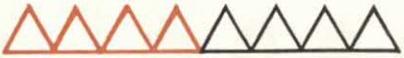
Jane: "Well, you probably know an addition fact that is about the same as 4 and 5. For example, do you know how much 4 and 4 are?"

Debby: "That's easy, 4 and 4 are 8."

Jane: "Well, if 4 and 4 are 8, then 4 and 5 must equal 9, since 5 is 1 more than 4. Look, I'll draw you a picture to show why this is so."

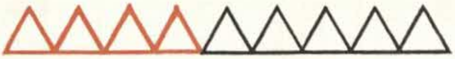
Here is the picture Jane drew:

$4 + 4 = 8$



so

$4 + 5 = 9$



See if you can "think" addition facts as Jane did:

1. 3 and 3 are .6. ., so 3 and 4 are 7. .

2. 3 and 5 are .8. ., so 3 and 6 are 9. .

3. 5 and 4 are .9. ., so 5 and 5 are 10. .

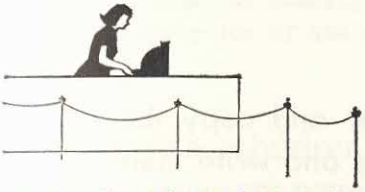
4. $\begin{array}{r} 2 \\ +2 \\ \hline 4 \end{array}$ $\begin{array}{r} 2 \\ +3 \\ \hline 5 \end{array}$ $\begin{array}{r} 7 \\ +1 \\ \hline 8 \end{array}$ $\begin{array}{r} 7 \\ +2 \\ \hline 9 \end{array}$ $\begin{array}{r} 3 \\ +6 \\ \hline 9 \end{array}$ $\begin{array}{r} 3 \\ +7 \\ \hline 10 \end{array}$ $\begin{array}{r} 1 \\ +8 \\ \hline 9 \end{array}$ $\begin{array}{r} 2 \\ +8 \\ \hline 10 \end{array}$

5. $5 + 5 = 10$, so $5 + 4 = 10 - 1 =$ .9. .

6. $3 + 6 = 9$, so $3 + 5 = 9 - 1 =$ .8. .

Being able to visualize and associate numbers mentally is an important step in moving from the level of working with manipulative materials to memorization. This ability provides the pupil with a fast way to rediscover facts if he forgets them.

1426



Redevelop the relationships between ordinal and cardinal numbers. A cardinal number tells "how many" whereas an ordinal number tells "which one." The ordinal numbers are emphasized on this page.

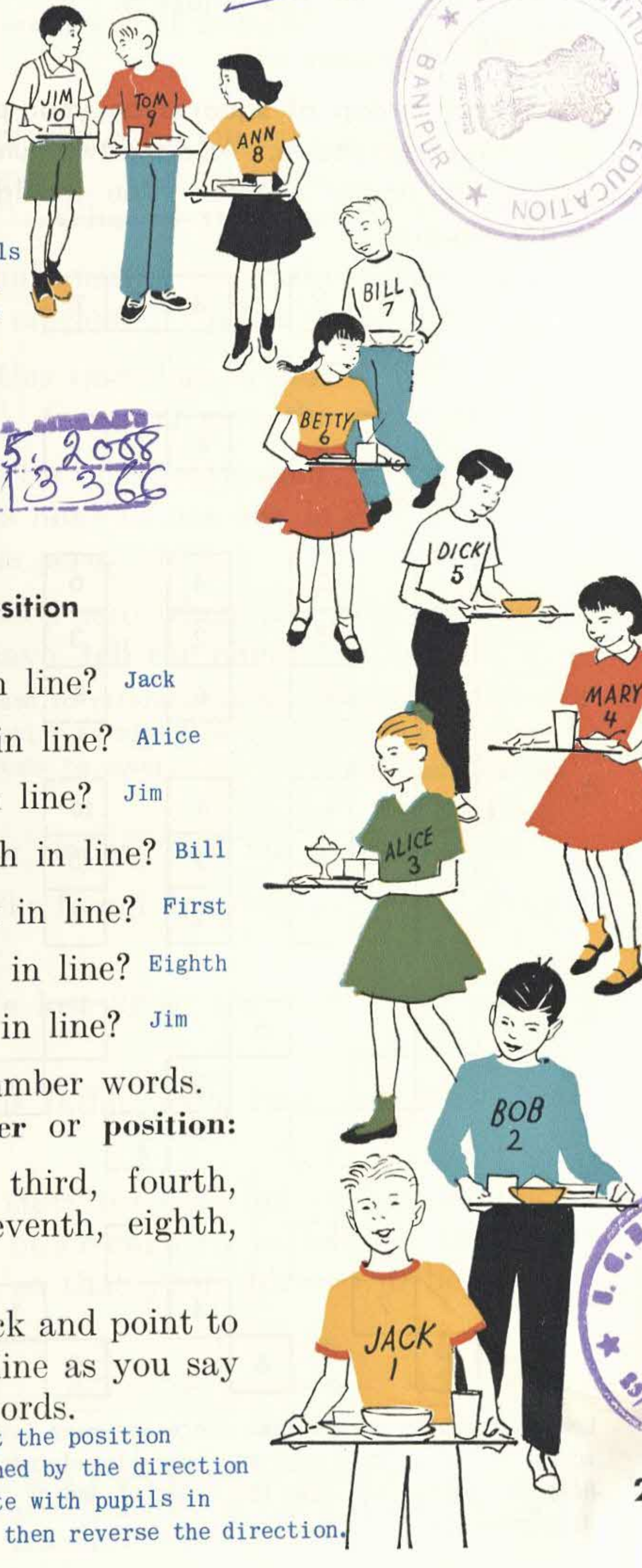
Date 16.5.2008
Acc. No. 13366

Words That Tell Position

1. Who is first in line? Jack
2. Who is third in line? Alice
3. Who is last in line? Jim
4. Who is seventh in line? Bill
5. Where is Jack in line? First
6. Where is Ann in line? Eighth
7. Who is tenth in line? Jim
8. Read these number words. They tell **order** or **position:**

   first, second, third, fourth, fifth, sixth, seventh, eighth, ninth, tenth.
9. Begin with Jack and point to each child in line as you say the number words.

Be sure pupils understand that the position of a pupil in line is determined by the direction the group is facing. Illustrate with pupils in line facing in one direction; then reverse the direction.

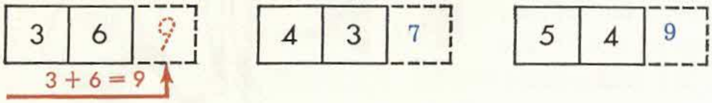


The main purpose of this page is to prepare the pupils for the addition patterns which follow on page 25.

Addition Fun

Draw each group of squares on your paper and copy the two numbers as shown. Add the two numbers and write their sum in the empty square. You should add towards the empty square.

1.



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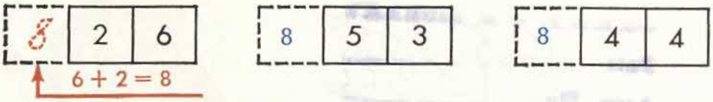

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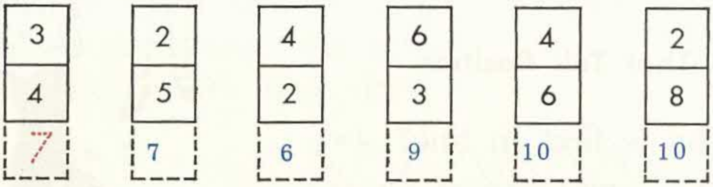

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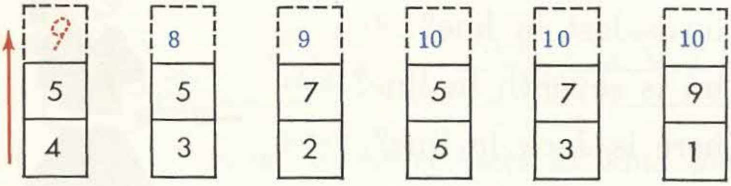

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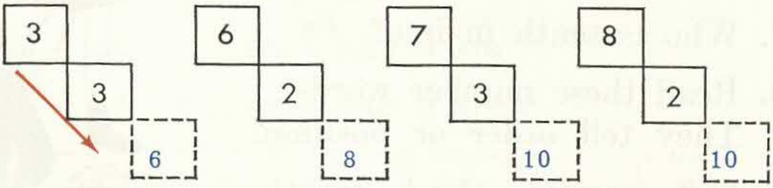

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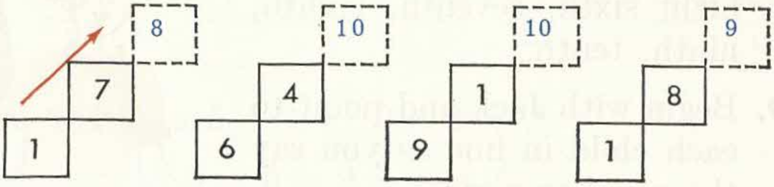


Lead the pupils to see that there are many interesting ways to write addition facts. This page may be followed immediately by page 25. Help the pupils see that the order of adding two numbers makes no difference in their sum.

Reteach the meaning of the word "zero" and the symbol "0" as a description of how many are in a group having no members.

The Meaning of Zero

1. The children were playing a guessing game. All the answers were numbers. Bill asked Ann, "How many legs has a cow?" What is the answer? 4

2. Then it was Ann's turn. She asked Bob, "How many legs has a chicken?" What is the answer? 2

3. Bob then gave this question to Bill: "How many legs has a fish?" Can you give the right answer? None

4. The answer to Bob's question is **none.** The number figure that means **none** or **not any** is **0.** The name of this number is **zero.** Stress.

5. Have you ever used zero when you were playing a game? If you have, tell the children about it.

The game period may be used to reinforce this concept of zero. Record scores in such tests of skill as ring toss or a game with bean bags, where zero scores are likely to occur.

Number Stories

Here are three number stories. Tell the answers:

6. Betty had 6¢. She found 4¢ in her old coat. Now she has ..10..¢.

7. Bob had 6¢. He lost 2¢ in the high grass. Now he has ..4..¢.

8. Jim had 5¢. His father gave him 5¢. Now Jim has ..10..¢.

9. Make a number story for each one of the examples below. Ask the other children to tell the answers. Watch the signs so that your stories will be right:

4	9	7	5	2	5	6	8
+4	−2	−5	+3	+7	−4	+3	−2
8	7	2	8	9	1	9	6

Defer the concept of zero as a place holder in a number like 20 until later. You may wish to mention at this time that 0 is also used as a reference point on a thermometer.

Reteach single column addition with 3 addends involving only the simpler addition facts already reviewed.

Adding Three Numbers

1. **Problem** Peter had 4 pennies. He found 1 penny and his mother gave him 2 pennies. How many pennies did Peter have then? 7

Explanation Write the numbers under each other. Then do the work like this:

Begin at the bottom and add up. Emphasize. Think, "2 and 1 are 3, 3 and 4 are 7." Write 7. You can add the numbers faster if you think only "2, 3, 7." Peter had 7 pennies in all.

4 ●●●●
1 ●
2 ●●
7

Check to see if the sum is correct by adding down. Think, "4, 5, 7." Does the sum check? Yes

2. Jack has 5 story books, 2 animal books, and 3 bird books. How many books does Jack have in all? 10

Add, starting at the bottom. Add down to check:

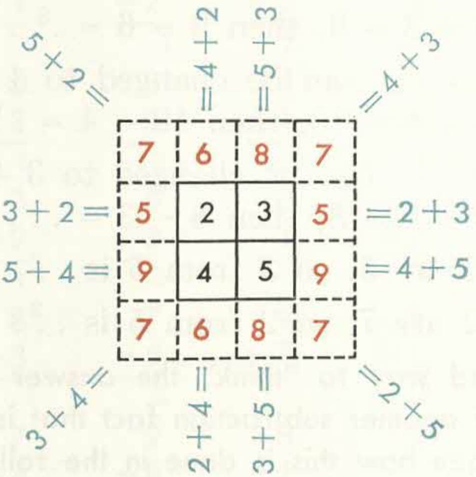
3.	3	2	3	5	2	5	1	4
	6	4	4	1	5	1	6	5
	1	2	3	4	1	2	2	1
	10	8	10	10	8	8	9	10
4.	6	2	3	5	2	1	8	4
	2	2	1	2	5	7	1	2
	1	5	6	2	3	1	1	3
	9	9	10	9	10	9	10	9
5.	1	4	5	7	4	1	6	3
	6	4	3	1	3	2	1	2
	3	1	2	2	1	4	2	3
	10	9	10	9	8	7	9	8

Be sure pupils understand process steps explained in ex. 1. This involves mental addition of a "seen" number to an "unseen" number (partial sum). Have pupils do ex. 3-5 orally to check this.

Encourage pupils to point out interesting number relationships in the number patterns. Help them read the directions.

Addition Patterns

1. Study how the numbers 2, 3, 4, and 5 are added in each direction below. Are the sums across from each other the same? Is the sum of two numbers the same if you reverse the order of adding them?



Copy and write the sums in the empty boxes:

2.

3	4	7	8
6	1	5	6
5	3	2	5
8	4	7	3

3.

10	8	7	5
9	6	3	9
6	2	4	6
5	8	7	10

4.

9	8	5	4
10	7	3	10
3	1	2	3
4	8	5	9

5.

7	9	8	10
9	4	5	9
8	5	3	8
10	9	8	7

The purpose of the number patterns is to provide basic practices in a new and interesting manner. The patterns should help reinforce the idea that the order of adding two numbers makes no difference in their sum.

Encourage pupils to develop and explain thought patterns for "thinking" subtraction facts when in doubt.

Help with Subtraction Facts

There are many ways to "think" subtraction facts in your mind just as there are many ways to "think" addition facts. One good way is to let an addition fact help you. See how this is done in these examples:

1. To find $9 - 6$ think, $6 + .?. = 9$
Since $6 + 3 = 9$, then $9 - 6 = .\overset{3}{?}.$

2. $10 - 4 = .?.$ can be changed to $4 + .?. = 10$.
Since $4 + 6 = 10$, then $10 - 4 = .\overset{6}{?}.$

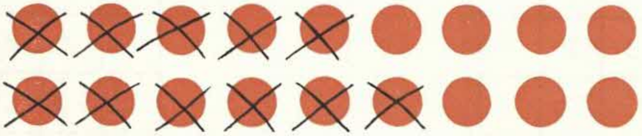
3. $8 - 3 = .?.$ can be changed to $3 + .?. = 8$.
Since $3 + 5 = 8$, then $8 - 3 = .\overset{5}{?}.$

4. 3 and 2 are 5, so 3 from 5 is $.\overset{2}{?}.$

5. 5 and 2 are 7, so 2 from 5 is $.\overset{3}{?}.$

Another good way to "think" the answer to a subtraction fact is to let another subtraction fact that is about the same help you. See how this is done in the following examples:

6. Suppose you don't remember what $9 - 6$ equals, but you know that $9 - 5 = 4$. Then $9 - 6 = 4 - 1 = 3$. Tell how this picture shows why this is so:



$9 - 5 = 4$

so

$9 - 6 = 3$

7. Since $10 - 2 = 8$, then $10 - 3 = .\overset{7}{?}.$

8. Since $7 - 3 = 4$, then $7 - 4 = .\overset{3}{?}.$

9. $\begin{array}{r} 9 \\ -3 \\ \hline 6 \end{array}$ $\begin{array}{r} 9 \\ -4 \\ \hline 5 \end{array}$ $\quad$ $\begin{array}{r} 7 \\ -5 \\ \hline 2 \end{array}$ $\begin{array}{r} 7 \\ -6 \\ \hline 1 \end{array}$ $\quad$ $\begin{array}{r} 9 \\ -7 \\ \hline 2 \end{array}$ $\begin{array}{r} 9 \\ -2 \\ \hline 7 \end{array}$ $\quad$ $\begin{array}{r} 10 \\ -5 \\ \hline 5 \end{array}$ $\begin{array}{r} 5 \\ +?\,5 \\ \hline 10 \end{array}$

Being able to "think" the answer to a subtraction fact by relating it to an addition fact or another subtraction fact is a much more mature and faster process than counting backward. In the end this should lead to immediate recall.

This page may be used either as further practice or as a test of mastery of subtraction facts with minuends of 10 or less.

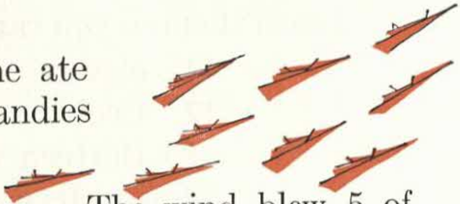
Subtraction Facts

Tell the answers to a friend. Learn the facts you missed:

1.	4 −3 1	9 −5 4	7 −3 4	3 −1 2	8 −4 4	10 −7 3	10 −2 8
2.	6 −4 2	2 −1 1	5 −2 3	9 −6 3	4 −2 2	10 −5 5	10 −3 7
3.	7 −6 1	6 −2 4	8 −6 2	4 −1 3	5 −4 1	10 −6 4	10 −8 2
4.	9 −4 5	3 −2 1	5 −3 2	6 −3 3	7 −2 5	10 −1 9	10 −4 6
5.	5 −1 4	8 −3 5	7 −5 2	9 −7 2	6 −1 5	10 −9 1	10 −5 5
6.	9 −2 7	7 −4 3	9 −8 1	8 −1 7	9 −3 6	10 −3 7	10 −6 4
7.	6 −5 1	8 −7 1	7 −1 6	8 −2 6	9 −1 8	8 −5 3	10 −7 3

Here are number stories that use the first three facts above. Tell the answers:

8. Ann bought 4 candies. She ate 3 of them. How many candies did she have left? 1



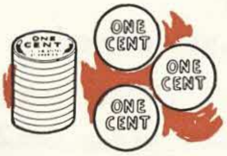
9. Dick made 9 paper airplanes. The wind blew 5 of them away. How many airplanes did Dick have left? 4

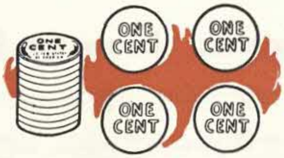
10. Mother had 7 eggs in a box. She used 3 eggs in a cake. How many eggs did she have left? 4

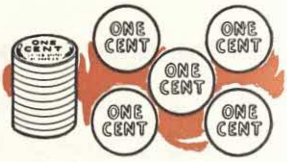
Check to see if pupils have learned the subtraction facts they missed on page 17. See that they practice regularly on the facts they miss. Have pupils use facts in number stories to check understandings and language facility.

Reteach number names and numerals from 11-20. Stress the meaning of "teen" as ten. Consult guide for further details.

Numbers 11 to 20


Betty


Jack


Ann

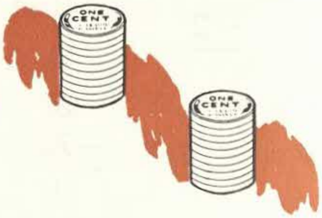
1. Betty has 10 pennies in a pile and 3 more pennies. How many pennies has Betty? 13 How many are 10 and 3? 13

2. Jack has 10 pennies and 4 more pennies. How many pennies has Jack? 14 How many are 10 and 4? 14

3. Ann has 10 pennies and 5 more pennies. How many pennies has Ann? 15 How many are 10 and 5? 15

4. How many are 10 and 1? 11 How many are 10 and 2? 12 How many are 10 and 6? 16 10 and 7? 17 10 and 8? 18 10 and 9? 19

5. There are 10 pennies in each pile at the right. How many are 10 pennies and 10 pennies? 20 How many are 10 and 10? 20 How many are 2 tens? 20



6. Here are the numbers from 11 to 20 with their names. Learn them so you can read them when you see them:

11	eleven	**16**	sixteen
12	twelve	**17**	seventeen
13	thirteen	**18**	eighteen
14	fourteen	**19**	nineteen
15	fifteen	**20**	twenty

7. Nineteen means nine and ten or 1 ten 9 ones.

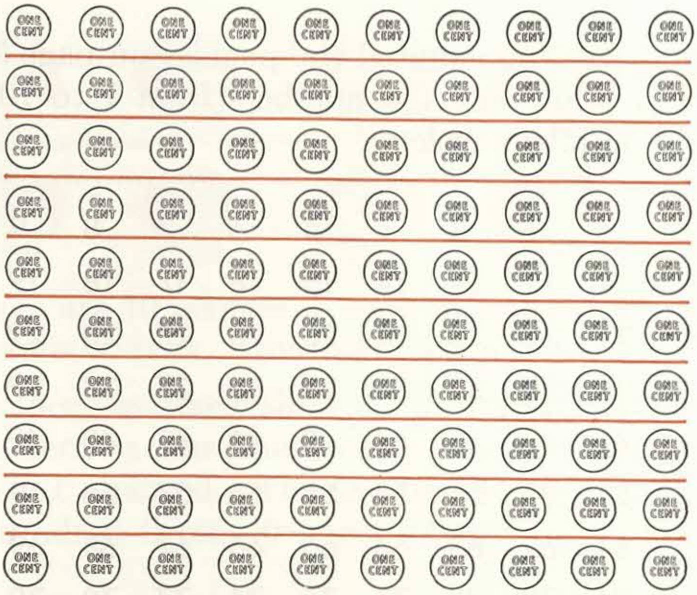
1 ten 4 ones 1 ten 7 ones 1 ten 5 ones

8. What does fourteen mean? ✓ seventeen? ✓ fifteen? ✓

Have pupils use toy money, bundles of sticks, or counters to show the meaning of the teen numbers. See that they keep the tens group apart from the ones group. Point out the peculiar way in which we say the "teen" after the number of ones.

Reteach counting by 10's to 100. Present zero as place holder.

How Many Pennies?



1. The children put pennies in 10 rows. They put 10 pennies in each row. The picture shows how the pennies looked. Point to the rows and count the pennies by rows, like this:

10 20 30 40 50 60 70 80 90 100

2. You know that 20 is 2 tens. How many tens make 30? 3 How many tens make 40? 4 50? 5 60? 6 90? 9

3. You have counted the pennies above by rows. You were counting the pennies by 10's.

4. Here are the number names when you count by 10's:

10	20	30	40	50
ten	twenty	thirty	forty	fifty
60	70	80	90	100
sixty	seventy	eighty	ninety	one hundred

5. Fifty is .5. . tens. Eighty is .8. . tens.

Let pupils count other objects (piles of ten) such as beads, buttons, straws. Stress tens nature of numbers (twenty is 2 tens or 20). Use abacus or place pocket chart to show other 2-place numbers and zero as place holder.

Illustrate with a large "hundred" chart. If a commercial chart is not available, one can easily be made.

Numbers to 100

1. Suppose you counted the pennies on page 29 by 1's. You would say the numbers from 1 to 100. Read the numbers below:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

2. Find 42 above. You see that 42 is 4 rows of tens and 2 more. The 4 in 42 shows the tens, and the 2 shows the ones. 42 is a **two-place** number and means 4 tens 2 ones. Find 36 above. What does 36 mean? 3 tens and 6 ones or 3 tens 6 ones

Tens	Ones
4	2

3. How many are 6 tens 8 ones? 68 9 tens 4 ones? 94

Tell what number goes in each space:

4. 4 tens make . 40 . 9 tens 2 ones make . 92 .

5. 7 tens make . 70 . 6 tens 0 ones make . 60 .

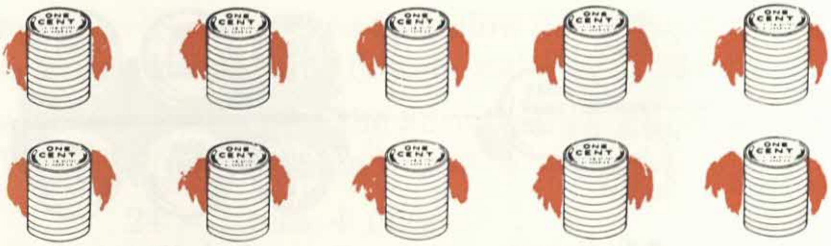
6. 83 means . 8 . tens . 3 . ones.

7. 38 means . 3 . tens . 8 . ones.

Attach the hundred chart to a bulletin board and use it in a variety of ways. One way is to pin small squares of paper over some of the numbers and to have the pupils take turns telling what numbers are hidden and explaining why they are right.

Extend understanding of tens nature of number system to hundreds.

The Meaning of Numbers



1. There are 10 pennies in each pile above. Count the pennies by tens. How many pennies are there in all? 100

2. The pennies above show **ten tens.** Another name for ten tens is **one hundred.** You see that 10 tens make 1 hundred. The number 100 means 10 tens or 1 hundred 0 tens 0 ones. Stress.

Write the number that means

3. 7 tens 4 ones 74 | 1 ten 8 ones 18
4. 5 tens 8 ones 58 | 4 tens 5 ones 45
5. 2 tens 6 ones 26 | 7 tens 2 ones 72
6. 9 tens 3 ones 93 | 10 tens 0 ones 100

Write these numbers in figures: Have pupils also write these numbers on own place-value diagram.

7. twenty-six 26 | fifty-one 51 | seventy-two 72
8. forty-seven 47 | thirty-eight 38 | eighty-four 84
9. ninety-three 93 | sixty-five 65 | twenty-nine 29

10. Write the smallest number you can with the figures 3 and 9. 39 Then use the same figures to write the largest number you can. 93

11. What is the smallest number that has 2 figures? 10 What is the largest number that has 2 figures? 99

Reinforce meaning of zero as place holder in ex. 2. Use abacus or pocket chart to demonstrate. Let pupils work with bundles of tens and single sticks to show numbers.

Reteach addition of 2-figure numbers with emphasis on place value.

Adding Money

Bill's Money

Ann's Money

1. Bill saved 2 dimes and 1 penny. Ann saved 2 dimes and 4 pennies. How much money in all had they saved? You see that together they had 4 dimes and 5 pennies. 4 dimes and 5 pennies equal 45¢. So 21¢ + 24¢ = 45¢.

2. Mary saved 15¢ and Susan saved 22¢. How much did they both save? How much is 15¢ + 22¢? Here is a way to find out:

15¢ = 1 dime 5 pennies
22¢ = 2 dimes 2 pennies
3 dimes 7 pennies, or 37¢

So 15¢ + 22¢ = 37¢. You can also write 15¢ over 22¢, as shown at the right. You write the sum 37¢ below the line.

$$\begin{array}{r} 15¢ \\ +22¢ \\ \hline 37¢ \end{array}$$

Use dimes and pennies of play money to find the answers. Then try to find the answers without using play money:

3.	26¢ +33¢ 59 ¢	34¢ +54¢ 84 ¢	53¢ +12¢ 65 ¢	41¢ +28¢ 69 ¢	13¢ +46¢ 59 ¢	64¢ +25¢ 89 ¢
4.	45¢ +53¢ 98¢	73¢ +14¢ 87 ¢	32¢ +66¢ 98¢	25¢ +64¢ 89 ¢	17¢ +52¢ 69 ¢	84¢ +13¢ 97 ¢

More Practice. See ① on page 313.*

*See page 327 of text, "Supplementary Exercises," for explanation. Use wall pocket chart and large display coins to explain ex. 1-2. Emphasize that pennies are added to pennies and dimes to dimes. Have pupils illustrate ex. 3-4 with pictures of coins used.

Relate the addition of tens and ones to the addition of dimes and pennies discussed on the previous page.

Adding More Two-Place Numbers

1. **Problem** Susan picked 24 yellow flowers and 35 blue flowers. How many flowers did Susan pick?

Explanation To find the answer, you add 24 and 35. Write 35 under 24 and draw a line.

$$\begin{array}{r@{\;=\;}l} 24 & 2 \text{ tens } 4 \text{ ones} \\ \underline{35} & \underline{3 \text{ tens } 5 \text{ ones}} \\ & 5 \text{ tens } 9 \text{ ones, or } 59 \end{array}$$

Tens	Ones
2	4
+3	5
5	9

When you add, begin at the bottom and add up. Here is the way to think to find the answer:

5 ones + 4 ones = 9 ones. Write 9 in ones place.
3 tens + 2 tens = 5 tens. Write 5 in tens place.

The answer is 59. Susan picked 59 flowers.

Ask the pupils whether the 5 or the 9 shows more flowers. Be sure they know that the 5 stands for 5 tens or 50.

Add these numbers:

2.	32	21	34	45	52	41	16	83
	13	46	62	42	46	15	13	14
	45	67	96	87	98	56	29	97
3.	31	46	35	42	67	14	33	21
	37	53	43	23	22	62	41	22
	68	99	78	65	89	76	74	43
4.	21	27	52	51	32	24	64	35
	41	12	45	27	62	63	15	51
	62	39	97	78	94	87	79	86

5. **Problem** Find the sum of 42 and 37.

Explanation You can do the work quickly, like this: Think "7, 9." Write 9 in ones place. Think "3, 7." Write 7 in tens place. The answer is 79.

Tens	Ones
4	2
+3	7
7	9

More Practice. See ② on page 313.

Have children demonstrate the meaning of the addition with objective materials such as tongue depressors, which can be bundled by tens. These materials should be placed in the pockets of a clearly labeled place-pocket chart as they add.

Provide review of work retaught in chapter (pages 34-35).

Counting Dimes and Nickels

1. Count these dimes by 10's. 5 dimes make .50.¢.

2. Use play money to count the number of cents in 6 dimes. 60¢ Then use play money to count the number of cents in 8 dimes. 80¢

3. Ann has 7 dimes. How many cents has she? 70¢

4. Count these nickels by 5's. They make .25.¢.

5. Tom has 7 nickels. How much money has he? 35¢ Draw 7 nickels on paper. Write 5¢ on each one. Then count Tom's nickels by 5's to see how many cents they make.

Tell what number goes in each space:

6. 2 nickels make .10. cents. 3 dimes make .30.¢.

7. 6 nickels make .30. cents. 9 dimes make .90.¢.

8. 1 dime and 1 nickel make .15. cents.

9. 1 dime and 4 cents make .14. cents.

10. 1 nickel and 5 cents make .10. cents.

11. Bob had a nickel and a penny. How much money did Bob have all together? 6¢

12. How many cents do 5 nickels make? 25¢

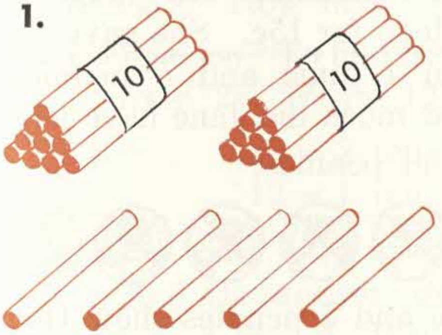
Provide pupils with play money if they have difficulty in doing these exercises. Review equivalences of dime, nickel, and cent. Have pupils make up puzzles, such as, "I have three coins that are worth 16¢. What are they?"

Continue to emphasize the structure of two-place numbers. Demonstrate with large objective materials which can be bundled.

More Two-Place Numbers

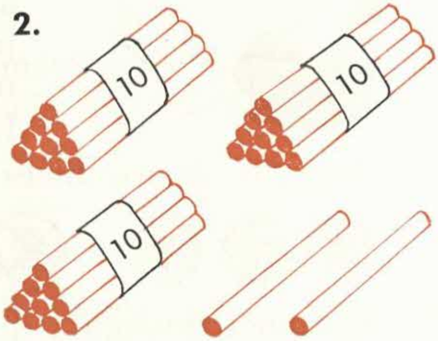
How many sticks are in each group?

1.



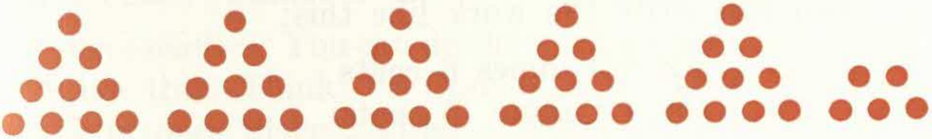
.2. . tens .5. . ones or .25. .

2.



.3. . tens .2. . ones or .32. .

3. How many dots are there in all?



.5. . tens .5. . ones = .55. .

4. 62 = .6. . tens .2. . ones   9 tens 7 ones = .97. .

5. 49 = .4. . tens .9. . ones   8 tens 3 ones = .83. .

6. 94 = .9. . tens .4. . ones   9 tens 0 ones = .90. .

7. 70 = .7. . tens .0. . ones   3 tens 5 ones = .35. .

8. What number comes after 5 tens 9 ones? 60

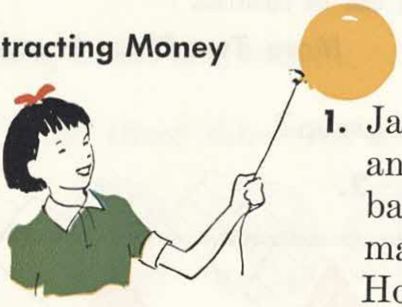
9. What number comes before 6 tens 0 ones? 59

10. Make 43 dots on your paper. Draw a line around each group of ten dots. How many tens were there? 4 How many ones were left? 3

If you feel that more practice is needed with dot diagrams, ask the pupils to picture the meaning of other numbers in the same way. A thorough understanding of the structure of two-place numbers will facilitate subsequent number work.

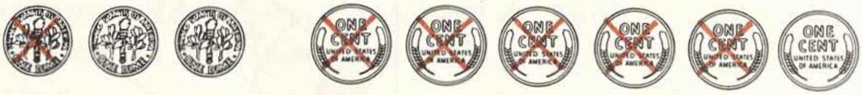
Reteach subtraction of 2-figure numbers with emphasis on place value.

Subtracting Money



1. Jane had 36¢. She had 3 dimes and 6 pennies. She bought a balloon for 15¢. She gave the man 1 dime and 5 pennies. How much did Jane have left? 21¢

Here are Jane's dimes and pennies:



The lines through 1 dime and 5 pennies show that those were spent. The other coins show how much money Jane had left. How much did she have left? 21¢ How much is 15¢ from 36¢? 21¢

2. You do not need a picture to help you subtract. You can write the work like this:

36¢ = 3 dimes 6 cents
15¢ = 1 dime 5 cents
2 dimes 1 cent, or 21¢

36¢
−15c
21¢

When you do the work above, think, "5 cents from 6 cents, 1 cent." Write 1 cent. Then think, "1 dime from 3 dimes, 2 dimes." Write 2 dimes.

Use dimes and pennies of play money to find the answers. Then try to find the answers without using play money:

3.	35¢ −12¢ 23¢	48¢ −25¢ 23¢	54¢ −31¢ 23¢	99¢ −75¢ 24¢	86¢ −32¢ 54¢	75¢ −64¢ 11¢
4.	79¢ −36¢ 43¢	87¢ −75¢ 12¢	98¢ −54¢ 44¢	64¢ −33¢ 31¢	55¢ −14¢ 41¢	89¢ −24¢ 65¢

More Practice. See ③ on page 313.

Follow procedure for page 32. Stress fact that pennies are taken from pennies, dimes from dimes.

Extend subtraction of 2-figure numbers to include abstract numbers.

Subtracting More Two-Place Numbers

1. **Problem** Jack got 25 eggs from his hens. He sold 12 eggs. How many eggs did Jack have left? 13

Explanation To find how many are left, you subtract 12 from 25. Write 12 under 25 and draw a line.

$$\begin{array}{rcl} 25 & = & 2 \text{ tens } 5 \text{ ones} \\ \underline{12} & = & \underline{1 \text{ ten } 2 \text{ ones}} \\ & & 1 \text{ ten } 3 \text{ ones, or } 13 \end{array}$$

To find the answer, think, "2 ones from 5 ones, 3 ones." Write 3 in ones place. Think, "1 ten from 2 tens, 1 ten." Write 1 in tens place. The answer is 13. Jack had 13 eggs left.

Tens	Ones
2	5
−1	2
1	3

2. **Problem** Subtract 35 from 69.

Explanation You can do the work quickly, like this: Think, "5 from 9, 4." Write 4 in ones place. Think, "3 from 6, 3." Write 3 in tens place. The answer is 34.

Tens	Ones
6	9
−3	5
3	4

Subtract these numbers:

3.	56 14 42	73 52 21	98 67 31	56 42 14	89 26 63	47 35 12	75 21 54	99 24 75
4.	38 13 25	97 13 84	75 44 31	48 24 24	79 37 42	62 31 31	89 58 31	73 61 12
5.	85 63 22	94 81 13	68 55 13	97 52 45	82 11 71	69 22 47	56 33 23	36 25 11

More Practice. See ④ on page 314.

To the Teacher. See page 328 for the additive method of subtraction.

Have pupils demonstrate ex. 3-5 on pocket chart. Stress that ones are subtracted from ones, tens from tens. Let them also explain exercises using place-value diagram. Let brighter pupils make up problems for arithmetic corner.

Prepare for chapter test. Review some addition and subtraction terms. Provide practice in adding and subtracting 2-place numbers.

Addition and Subtraction Review

1. Jane earned 75¢ by wheeling the baby after school. Jane wants 98¢ for a new game. How much more does she need? 23¢

2. Joe had 12 chickens. Today he bought 15 more chickens. How many chickens has Joe now? 27

3. Susan had 25 tickets to sell for a school play. She sold 13 of them today. How many tickets has Susan left to sell? 12

4. Billy wants to buy a game for 59¢. He earned 35¢ today. How many more cents does he need? 24¢

Add these numbers:

5.	14	44	76	23	23	34	65
	42	34	21	64	36	11	34
	56	78	97	87	59	45	99
6.	21	51	35	42	61	21	33
	78	23	23	54	21	52	35
	99	74	58	96	82	73	68

Subtract these numbers:

7.	79	57	96	89	65	84	79
	22	45	73	66	42	73	63
	57	12	23	23	23	11	16
8.	89	26	97	58	79	87	98
	41	15	41	35	48	33	52
	48	11	56	23	31	54	46
9.	64	38	95	76	88	53	56
	22	21	34	54	56	11	21
	42	17	61	22	32	42	35

Have pupils explain their work orally. Check to see that they proceed from ones to tens. Review, if necessary, using place-value diagram or place-value pocket chart.

Provide review of basic understandings and skills retaught in this chapter.

Chapter Review

Give the answers. Watch the signs: Stress.

1.	7	2	9	3	10	10	4
	+3	+6	−5	+6	−4	−7	+5
	10	8	4	9	6	3	9
2.	51	24	58	56	34	64	23
	+35	+52	+41	+22	+34	+31	+15
	86	76	99	78	68	95	38
3.	95	97	27	56	68	74	88
	−44	−64	−13	−32	−53	−62	−46
	51	33	14	24	15	12	42
4.	52	69	47	33	78	62	95
	+14	−43	+52	+64	−52	+16	−22
	66	26	99	97	26	78	73

5. How many cents make 1 nickel? 5

6. How many cents make 1 dime? 10

7. How many cents do 9 nickels make? 45

8. How many cents do 4 dimes make? 40

9. Which is the largest number? 18 [✓ 36] 29

10. Which is the smallest number? 45 54 [✓ 19]

11. 4 tens and 6 ones make what number? 46

12. 6 tens and 4 ones make what number? 64

13. What does the 7 in 47 mean? ↓ 7 ones What does the 7 in 74 mean? ↑ 7 tens What does the 0 in 70 mean? 0 ones

14. Count by 1's from 50 to 65; from 73 to 85.

15. Count by 10's from 30 to 80; (1) from 20 to 90. (2)

(1) 30, 40, 50, 60, 70, 80; (2) 20, 30, 40, 50, 60, 70, 80, 90

16. Count by 10's from 25 to 85; (1) from 32 to 92. (2)

(1) 25, 35, 45, 55, 65, 75, 85; (2) 32, 42, 52, 62, 72, 82, 92

17. Count by 5's from 5 to 50; (1) from 5 to 100. (2) (1,2) 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100

18. Count by 5's from 8 to 53; (1) from 17 to 47. (2)

(1) 8, 13, 18, 23, 28, 33, 38, 43, 48, 53; (2) 17, 22, 27, 32, 37, 42, 47

Note individual errors or weaknesses on pupils' progress cards. Regroup children for reteaching based on needs.

You may wish to have the pupils write a number sentence for each problem. For example, in ex. 1: 5¢ + 4¢ + 1¢ = 10¢.

A Problem Test

1. At the store Dick spent 5¢, 4¢, and 1¢. How much money in all did he spend? 10¢
2. In her garden Jane saw 3 blue flowers, 5 white flowers, and 2 yellow flowers. How many flowers did Jane see all together? 10
3. Jane had 10 flowers in her garden. She picked 4 of them. How many flowers were left? 6
4. There are 15 boys and 14 girls in Peter's room at school. How many children are in his room? 29
5. Ann had 36 boxes of cookies to sell. She sold 12 boxes on her street. How many boxes did she have left to sell? 24
6. Susan spent 8¢ to ride on the bus. She also spent 2¢ for a stick of candy. How much money did Susan spend all together? 10¢
7. Bill has 11 brown hens and 14 white hens. How many hens has Bill in all? 25
8. A man in the park had 9 balloons to sell. The children bought 6 of them. How many balloons did the man have left? 3
9. Tom bought 4 white rabbits and 2 brown rabbits. How many rabbits did Tom buy? 6
10. Mary saved 75¢. Then she spent 22¢ for ribbon. How much money did Mary have left? 53¢

This is a test to see how well you can do problems. Look your work over before you leave it. Try to get every problem right. Each one right counts 10.

Remind pupils to read problems carefully with questions in mind, that is, what does problem ask them to find, what facts are known, what process must be used to find answer, how should problem be written in numbers.

Consult the Teacher's Guide for the specific aims of Chapter 2 and a discussion of methods of teaching number facts.

Chapter 2

A Picnic in the Park

Present four addition facts (doubles), with sums greater than 10 (pages 41-42).

1. The girls made sandwiches for a picnic. They made 6 brown bread sandwiches and 6 white bread sandwiches. How many sandwiches did they make? 12 How many are 6 sandwiches and 6 sandwiches? 12 How many are 6 and 6? 12

$$\begin{array}{r}6\\+6\\\hline 12\end{array}$$

---

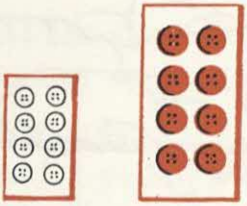
2. Each child spent 7¢ to ride to the picnic on a bus. Each one paid 7¢ to ride back. How many cents did each child spend? 14¢ How many are 7¢ and 7¢? 14¢ How many are 7 and 7? 14

$$\begin{array}{r}7\\+7\\\hline 14\end{array}$$

3. 6 + 6 = 12 . 7 + 7 = 14 . 6 + 6 = 12 . 7 + 7 = 14 .

Before introducing this page, have pupils make up and dramatize problems involving the above facts. Then have them demonstrate the facts with objects. Lastly, have them illustrate the facts by drawing dots, squares, or circles.

More Addition Facts



1. Ann bought buttons for her dress and coat. She got 8 small buttons and 8 large buttons. How many buttons did she buy? 16 How many are 8 buttons and 8 buttons? 16 How many are 8 + 8? 16

$$\begin{array}{r} 8 \\ +8 \\ \hline 16 \end{array}$$

2. For Jack's birthday party his mother bought paper hats. She bought 9 hats for the girls and 9 hats for the boys. How many paper hats did she buy? 18 How many are 9 hats and 9 hats? 18 How many are 9 + 9? 18

$$\begin{array}{r} 9 \\ +9 \\ \hline 18 \end{array}$$

3. How many are 8 stars and 8 stars? 16

4. How many are 9 dots and 9 dots? 18

5. How many are 7 eggs and 7 eggs? 14

Stress. **6.** Numbers like 7 and 7 are called **doubles** because both numbers are the same. Name as many doubles as you can. Also tell their answers. The doubles will help you to learn other addition facts.

Add these numbers:

7.

$$\begin{array}{r} 6 \\ 6 \\ \hline 12 \end{array} \quad \begin{array}{r} 9 \\ 9 \\ \hline 18 \end{array} \quad \begin{array}{r} 5 \\ 5 \\ \hline 10 \end{array} \quad \begin{array}{r} 7 \\ 7 \\ \hline 14 \end{array} \quad \begin{array}{r} 4 \\ 4 \\ \hline 8 \end{array} \quad \begin{array}{r} 8 \\ 8 \\ \hline 16 \end{array} \quad \begin{array}{r} 2 \\ 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 3 \\ 3 \\ \hline 6 \end{array}$$

8. 9 + 9 = 18 8 + 8 = 16 6 + 6 = 12 7 + 7 = 14

9. 5 + 5 = 10 3 + 3 = 6 4 + 4 = 8 1 + 1 = 2

See suggestions for page 41. Be sure to use objects liberally in developing facts. Have children demonstrate new facts in problems for class to solve.

Teach the four subtraction facts that are related to the addition doubles presented on pages 41-42.

More Subtraction Facts

1. You see 12 stars in a row. Take away 6 stars. Put paper over them. How many stars are left? 6
6 and 6 are 12, so 6 from 12 is .6. .

$\begin{array}{r}12\\-6\\\hline 6\end{array}$

2. You see 14 circles in a row. Take away 7 circles. Put paper over them. How many circles are left? 7
7 and 7 are .14 ., so 7 from 14 is .7. .

$\begin{array}{r}14\\-7\\\hline 7\end{array}$

3. On paper draw 16 dots. Take away 8 dots. How many dots are left?
8 and 8 are .16 ., so 8 from 16 is .8. .

$\begin{array}{r}16\\-8\\\hline 8\end{array}$

4. On paper draw 18 dots. Take away 9 dots. How many dots are left? 9
9 and 9 are .18 ., so 9 from 18 is .9. .

$\begin{array}{r}18\\-9\\\hline 9\end{array}$

5. 7 from 14 is . 7 . 4 from 8 is .4. .
6. 6 from 12 is . 6 . 2 from 4 is .2. .
7. 9 from 18 is . 9 . 1 from 2 is .1. .
8. 5 from 10 is . 5 . 3 from 6 is .3. .
9. 8 from 16 is . 8 . 9 from 18 is 9. . .
10. 7 from 14 is . 7 . 8 from 16 is 8. . .

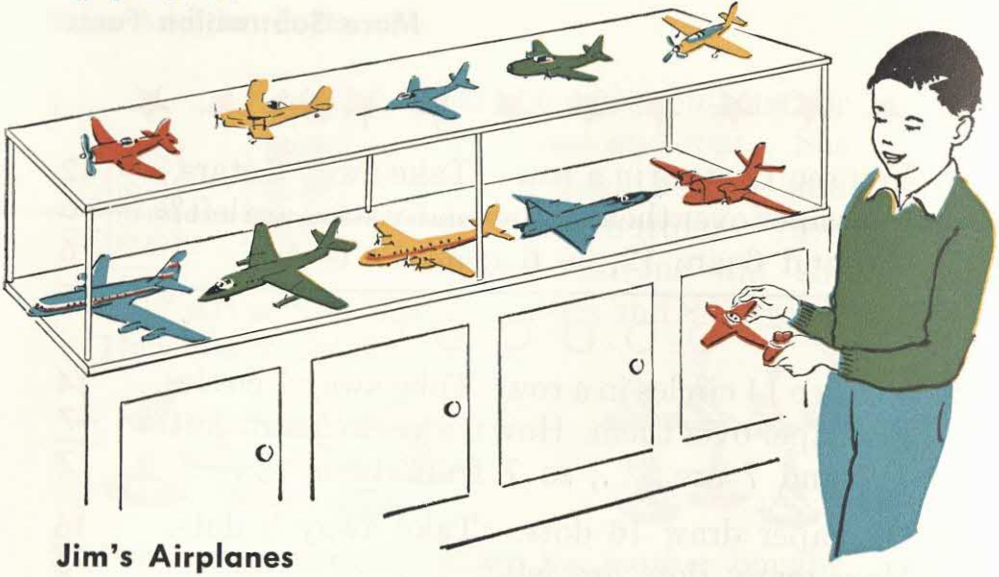
Subtract these numbers:

11. $\begin{array}{r}12\\-6\\\hline 6\end{array}$ $\begin{array}{r}16\\-8\\\hline 8\end{array}$ $\begin{array}{r}14\\-7\\\hline 7\end{array}$ $\begin{array}{r}10\\-5\\\hline 5\end{array}$ $\begin{array}{r}18\\-9\\\hline 9\end{array}$ $\begin{array}{r}14\\-7\\\hline 7\end{array}$ $\begin{array}{r}16\\-8\\\hline 8\end{array}$ $\begin{array}{r}8\\-4\\\hline 4\end{array}$

12. $\begin{array}{r}10\\-5\\\hline 5\end{array}$ $\begin{array}{r}12\\-6\\\hline 6\end{array}$ $\begin{array}{r}16\\-8\\\hline 8\end{array}$ $\begin{array}{r}18\\-9\\\hline 9\end{array}$ $\begin{array}{r}12\\-6\\\hline 6\end{array}$ $\begin{array}{r}18\\-9\\\hline 9\end{array}$ $\begin{array}{r}14\\-7\\\hline 7\end{array}$ $\begin{array}{r}6\\-3\\\hline 3\end{array}$

Have pupils show related addition fact first, using objects to combine two groups of 6 to make 12. Then have them take away 6 to discover subtraction fact. Follow same plan for other facts.

Teach 8 addition facts (near doubles) by relating them to doubles (pages 44-45).



Jim's Airplanes

1. Jim likes airplanes better than any other toys. Yesterday he had 5 large planes and 5 small planes. Today he bought another small plane. How many airplanes has Jim now? 11

5 planes and 5 planes are .10. planes. So 5 planes and 6 planes are .11. planes. 5 and 5 are .10., so 5 and 6 are 1 more, or .11. 5 and 6 are .11. How many are 6 and 5? 11

$$\begin{array}{r} 5 \\ +6 \\ \hline 11 \end{array} \qquad \begin{array}{r} 6 \\ +5 \\ \hline 11 \end{array}$$

2. 6 planes and 7 planes are how many planes? 13 Think, "6 planes and 6 planes are .12. planes. So 6 planes and 7 planes are .13. planes." How many are 6 and 7? 13 How many are 7 and 6? 13

$$\begin{array}{r} 6 \\ +7 \\ \hline 13 \end{array} \qquad \begin{array}{r} 7 \\ +6 \\ \hline 13 \end{array}$$

Show relation of double to near double through objects first. Have pupils use counters to show sum of 5 + 5, then add 1 more to one of the 5's. Let them discover that sum is then 1 more. Have pupils show relationship with dots, squares, or circles.

3. 7 planes and 7 planes are $\overset{14}{\ldots}$ planes. 7 planes and 8 planes are 1 more than 7 planes and 7 planes. So 7 planes and 8 planes are $\overset{15}{\ldots}$ planes. How many are 7 + 8? 15 How many are 8 + 7? 15

$$\begin{array}{r}7\\+8\\\hline 15\end{array}\qquad\begin{array}{r}8\\+7\\\hline 15\end{array}$$

4. 8 planes and 8 planes are $\overset{16}{\ldots}$ planes. 8 planes and 9 planes are 1 more than 8 planes and 8 planes. So 8 planes and 9 planes are $\overset{17}{\ldots}$ planes. How many are 8 + 9? 17 How many are 9 + 8? 17

$$\begin{array}{r}8\\+9\\\hline 17\end{array}\qquad\begin{array}{r}9\\+8\\\hline 17\end{array}$$

5. 6 and 6 are $\overset{12}{\ldots}$, so 6 and 7 are $\overset{13}{\ldots}$ How many are 6 + 7? 13 How many are 7 + 6? 13

6. 7 and 7 are $\overset{14}{\ldots}$, so 7 and 8 are $\overset{15}{\ldots}$ How many are 7 + 8? 15 How many are 8 + 7? 15

7. 8 and 8 are $\overset{16}{\ldots}$, so 8 and 9 are $\overset{17}{\ldots}$ How many are 8 + 9? 17 How many are 9 + 8? 17

8. 8 and 8 help you to add 8 and 9. 8 and 8 are **doubles.** 8 and 9 are called **near doubles** because 9 is only 1 more than 8.

$$\begin{array}{r}8\\+8\\\hline\end{array}\qquad\begin{array}{r}8\\+9\\\hline\end{array}$$

Stress. → The sum of 8 and 9 is 1 more than the sum of 8 and 8. The **doubles** help you to add the numbers that are **near doubles.**

Find these sums: Ask pupil for double if he is unsure of fact.

9. $6 + 5 = \overset{11}{\ldots}$ $\quad 7 + 8 = \overset{15}{\ldots}$ $\quad 9 + 8 = \overset{17}{\ldots}$

10. $7 + 6 = \overset{13}{\ldots}$ $\quad 5 + 6 = \overset{11}{\ldots}$ $\quad 6 + 7 = \overset{13}{\ldots}$

11. $8 + 9 = \overset{17}{\ldots}$ $\quad 5 + 4 = \overset{9}{\ldots}$ $\quad 8 + 7 = \overset{15}{\ldots}$

Follow plan for page 44. This relationship should be used only in developing correct response to near-double fact, or when fact is forgotten. This is not necessary after responses become automatic.

Provide additional practice on doubles and near doubles.

Have You Learned These?

Tell what number should be put in each space:

1. 6 and 6 are .12., so 6 and 7 are .13..

2. 8 and 8 are .16., so 8 and 9 are .17..

3. 7 and 7 are .14., so 7 and 8 are .15..

4. 5 and 5 are .10., so 5 and 6 are .11..

5. 3 and 3 are .6., so 3 and 4 are .7..

6. 6 and 6 are .12., so 7 and 6 are .13..

7. 2 and 2 are .4., so 3 and 2 are .5..

8. 8 and 8 are .16., so 9 and 8 are .17..

9. There are 6 children playing a game and 7 children on roller skates. How many children are there all together? 13 How many are 6 and 7? 13

10. Betty picked 8 yellow flowers and 9 blue flowers. How many flowers did Betty pick in all? 17

11. 7 children and 8 children are .15.. children.

12. 8 children and 7 children are .15.. children.

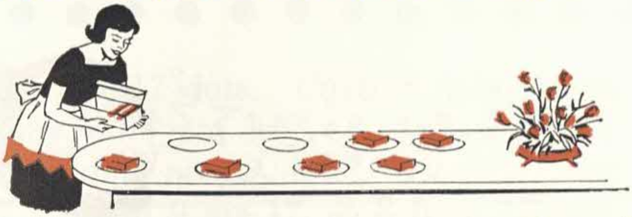
13. 6 children and 5 children are .11.. children.

Add. Tell which numbers are near doubles:

14.	6 5 11	8 9 17	4 5 9	7 7 14	3 4 7	6 5 11	7 6 13	4 3 7
15.	3 3 6	6 7 13	8 7 15	8 9 17	5 6 11	5 4 9	9 9 18	7 8 15
16.	8 7 15	6 6 12	9 8 17	4 4 8	3 2 5	8 8 16	6 7 13	5 5 10

If pupil forgets near-double fact, ask him for double fact. Stress fact that pupils can find answers in this way and also using principle of reverses (commutative principle).

Introduce addition situations where one of the addends is not given. Ask pupils to suggest ways to find the missing addend.



How Many More Are Needed?

1. **Problem** Linda's mother is serving ice cream to 8 children. She has already put ice cream on 6 plates. How many more plates need ice cream?

   Explanation The question can be asked this way: "6 and **how many more** are 8?" If you study the picture or remember that 6 + 2 = 8, you know that the answer is 2. But in problems with large numbers you will not always know the addition or have a picture to help you. In such cases you will need to subtract to find the answer. See why this is so:

   $$\text{Since } 6 + \boxed{\text{the number needed}} = 8,$$

   $$\text{then } \boxed{\text{the number needed}} = 8 - 6 = 2.$$

2. Linda's mother has made 24 cookies. She wants to make 36 in all. How many more should she make? 12

3. Linda's brother wants to buy a boat that costs 75¢. So far he has saved 51¢. **How much more** money will he need to save to buy the boat? 24¢

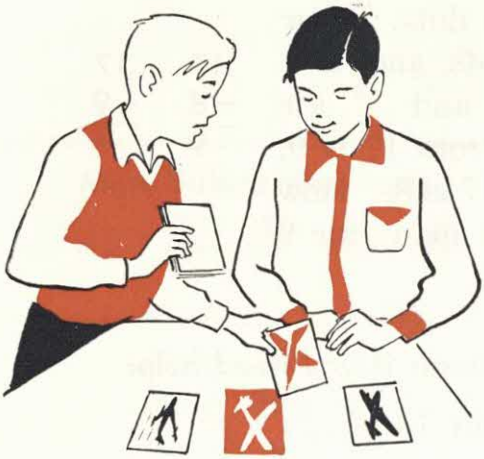
Emphasize this.

To find how many more are needed, or how much more is needed, you subtract.

Lead pupils to see that, although the missing addend could be found in such simple problems as ex. 1 by counting or knowing the addition fact, in more complicated problems, such as ex. 2-3, the answers should be found by subtraction.

Review subtraction facts taught and expression "how many left."

Problems and Practice



1. Jack saved 15 cards with pictures of airplanes on them. He is giving Bill 7 of these cards. How many cards will Jack have left? 8 How many are 7 from 15? 8

2. Betty had saved 16¢. She bought ice cream for 8¢. How much money did Betty have left? 8¢

3. Larry has 6¢. He wants to buy some candy costing 13¢. How much more money does he need? 7¢

4. Peggy has 9¢. She wants to buy a doll's hat that costs 18¢. How much more money does she need? 9¢

5. Paula wants to buy a candy rabbit costing 15¢. She has 8¢. How much more money does she need? 7¢

Subtract these numbers: Remind pupils of related addition fact.

6.	8	7	6	10	18	12	13	17
	−3	−4	−2	−5	−9	−6	−7	−9
	5	3	4	5	9	6	6	8
7.	8	9	5	14	15	10	16	11
	−6	−4	−3	−7	−8	−8	−8	−5
	2	5	2	7	7	2	8	6
8.	4	7	8	10	11	17	13	15
	−2	−5	−4	−3	−5	−8	−6	−8
	2	2	4	7	6	9	7	7
9.	7	9	5	15	11	13	10	17
	−2	−6	−4	−7	−6	−7	−6	−9
	5	3	1	8	5	6	4	8

Note errors or hesitancy in ex. 6-9. Plan for reteaching using materials or flash cards. Have pupils make up original problems using facts and subtraction expression.

Evaluate ability to solve one-step problems involving both addition and subtraction thought patterns.

Problems

1. Ann had 16¢. She paid 8¢ to ride on a bus. How many cents did she have left? 8
2. Tom saved 62¢. Today he earned 25¢ more. How much money has Tom now? 87¢
3. Mother is making rolls. She has baked one pan of 9 rolls. She has 9 more rolls ready to bake. How many rolls will Mother have all together? 18
4. Dick would like to buy a hammer for 75¢. He has 53¢. How many more cents does he need? 22¢
5. Alice paid 8¢ for one paper doll and 9¢ for another. How much did Alice spend for both paper dolls? 17¢
6. Joe's book about airplanes has 96 pages. He has read 25 pages. How many more has he to read? 71
7. At the store Susan spent 3¢ for a pencil, 5¢ for paper, and 2¢ for a stick of candy. How many cents in all did Susan spend? 10¢
8. Jim has saved 7 box tops. He must have 15 box tops to get a cowboy hat. How many more does he need? 8
9. This morning Mary read 12 pages in her new story book. She has just read 14 more pages in that book. How many pages has Mary read all together? 26
10. Bill earned 75¢ today. He spent 33¢ to go to the movies. How much does he have left? 42¢
11. Betty has 4 black pencils, 1 blue pencil, and 3 red pencils. How many pencils has she all together? 8
12. Peter had 18¢. He spent 9¢ for a ball of string. How many cents did Peter have left? 9¢

Read problems orally. Have pupils discuss reasons why they add or subtract. Begin class chart showing thought patterns, illustrated sample problems, and written example. Have pupils make up similar problems using these patterns.

Introduce the comparison concept of subtraction involving the comparison of the sizes of two groups.

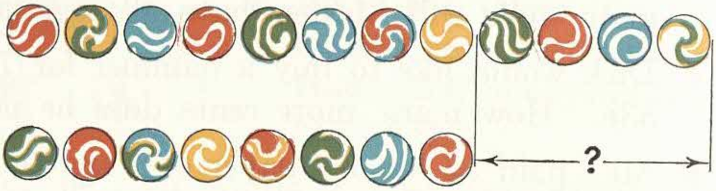
How Many More or How Many Fewer?

1. **Problem** Jerry has 12 marbles and Bill has 8 marbles. 4 How many more marbles does Jerry have than Bill? How many fewer marbles does Bill have than Jerry? 4

Explanation To answer these questions, we can make a picture and compare the boys' marbles:

Jerry's marbles

Bill's marbles



Jerry has .4. . **more** marbles than Bill.
Bill has . 4 . **fewer** marbles than Jerry.

Another way to answer the questions is to subtract. 12 − 8 = . 4 . Then how many more is 12 than 8? 4 How many fewer is 8 than 12? 4

---

2. John went to his grandfather's farm. He saw 9 cows and 7 sheep. How many more cows than sheep did he see? 2 How many fewer sheep than cows? 2
3. There were 5 white sheep and 2 black sheep. How many more white sheep were there than black sheep? 3
4. How many more are 89 than 34? 55
5. How many fewer are 31 than 97? 66

Emphasize and write on arithmetic chart.

To find how many more or how many fewer are in one group than in another, you subtract. The answer is called the difference.

Have the pupils suggest ways to find the answer in ex. 1. Lead them to see that, although the answers for simple problems such as ex. 1-3 could be found by counting or by adding, in more difficult problems it is best to subtract.

Extend the comparison concept of subtraction to money problems. Illustrate with play money as needed.

How Much More or How Much Less?

Balloon, 15¢

Airplane, 39¢

Ball, 17¢

Boat, 28¢

1. **Problem** The balloon costs 15¢. The airplane costs 39¢. Which of these two toys costs more? Airplane How much more does the airplane cost than the balloon? 24¢

Explanation In this problem we compare the two amounts of money by subtracting.

$$\begin{array}{r}39\text{¢}\\-15\text{¢}\\\hline 24\text{¢}\end{array}$$

39¢ is . 24 .¢ more than 15¢.
15¢ is . 24 .¢ less than 39¢.

---

2. Jack wants to buy the airplane or the boat. How much more does the airplane cost than the boat? 11¢ How much less does the boat cost than the airplane? 11¢
3. How much less does the ball cost than the airplane? 22¢
4. How much less does the ball cost than the boat? 11¢
5. How much more is 10¢ than 6¢? 4¢
6. How much less is 35¢ than 68¢? 33¢
7. How much more is 16¢ than 8¢? 8¢
8. Betty saved 75¢. Ann saved 43¢. How much less did Ann save than Betty? 32¢
9. Jack paid 85¢ for a game. Bill paid 62¢ for one. How much less did Bill pay for his game than Jack? 23¢

Emphasize and write on arithmetic chart.

To find how much more or how much less one number is than the other, you subtract.

Lead the pupils to see that, although we speak of "how many more" in the case of objects, we speak of "how much more" in the case of money. Have pupils demonstrate the problems with play money or drawings. Also state the problems differently, as in ex. 2.

After the pupils have completed the number patterns, have them point out interesting number relationships.

More Addition Patterns

Copy and write the sums in the empty boxes. Add in each direction as on page 25.

1.

14	9	15	10
15	7	8	15
9	2	7	9
10	9	15	14

2.

16	17	17	18
17	8	9	17
17	9	8	17
18	17	17	16

Can you find the missing numbers for these?

3.

12	10	9	7
9	6	3	9
10	4	6	10
7	10	9	12

4.

9	8	6	5
7	5	2	7
7	3	4	7
5→~~7~~	8	6	9

Finding the Number Subtracted

1. **Problem** Sam had 17 papers to sell. He has 8 left. How many papers did he sell? 9

Explanation Study the ways below of writing the problem. Tell how you can find the answer.

17 − .?. = 8 (9)

17 − 8 = .?. (9)

8 + .?. = 17 (9)

$$\begin{array}{r} 17 \\ -\,?\ (9) \\ \hline 8 \end{array} \qquad \begin{array}{r} 17 \\ -8 \\ \hline ?\ (9) \end{array}$$

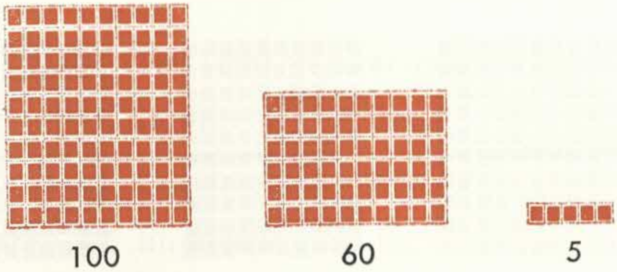
Find the missing numbers:

2. 15 − .?. = 8 (7) 11 − .?. = 6 (5) 13 − .?. = 7 (6)
3. 11 − .?. = 5 (6) 13 − .?. = 6 (7) 15 − .?. = 7 (8)
4. 18 − .?. = 9 (9) 14 − .?. = 7 (7) 16 − .?. = 8 (8)

You may need to assist the pupils to some extent in completing ex. 3-4. Although carrying in addition has not yet been taught you may have a bright pupil who discovers that the sums of the numbers in the outside rows or columns are the same.

Extend understanding of place value to hundreds place. Develop ability to read and use numbers greater than 100 (pages 55-57).

Three-Place Numbers



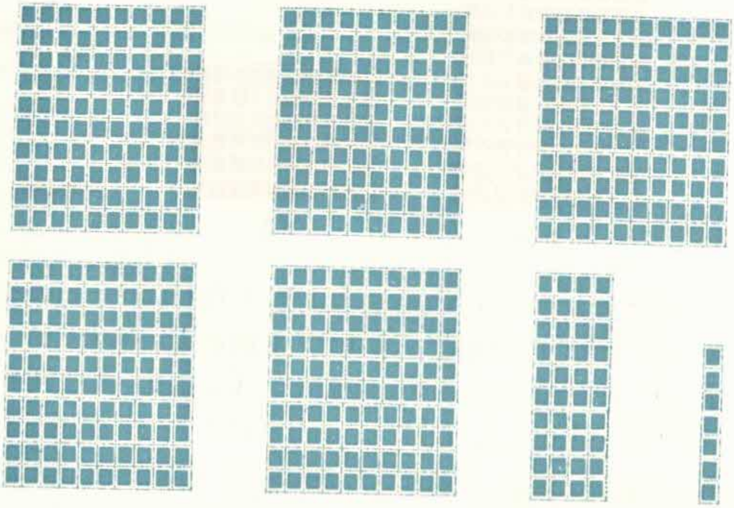
1. Bob bought 165 stamps for his father. He got one sheet of 100 stamps. There were 10 rows of stamps with 10 stamps in each row. Count the stamps in the large sheet by 10's. 10 tens = 1 hundred.
2. Bob also got 6 rows of stamps with 10 stamps in each row. Count the stamps in 6 rows by 10's.
3. The other 5 stamps made only part of a row. All together Bob had 100 stamps plus 60 stamps plus 5 stamps, or 165 stamps.
4. The number 165 has three places. You have learned that 65 means 6 tens and 5 ones. In 165 there is a third place at the left of tens place. This is **hundreds** place. 165 means 1 hundred 6 tens 5 ones. 165 is a **three-place** number. You read it **one hundred sixty-five.** Emphasize this.

Hundreds	Tens	Ones
1	6	5

5. Look at the picture of the stamps again. You see that there are 16 rows with 10 stamps in each row. This means there are 16 tens. So 165 can also mean 16 tens 5 ones.
6. The number 138 means 1 hundred 3 tens 8 ones. It can also mean 13 tens 8 ones.
7. Tell in two different ways what 184 means. 1 hundred 8 tens 4 ones; 18 tens 4 ones

Demonstrate numbers using large bundles of 100 sticks (10 groups of 10), smaller bundles of 10 sticks each, and single sticks. Let pupils use this material to show other numbers as all ones, tens and ones, or hundreds, tens, ones.

Three-Place Numbers



1. Look at the stamps above. Tell how many sheets of 100 stamps you see. Count them like this: 100, 200, . 300 . . , . 400 . . , . 500 . .

2. Count the rest of the stamps. How many are there all together? 547 means . 5 . hundreds . 4 . tens . 7 . . ones.

3. What does the number 871 mean? 8 hundreds 7 tens 1 one the number 926? 9 hundreds 2 tens 6 ones

4. The number 500 means 5 hundreds **no** tens **no** ones. You read it **five hundred.** The 0 next to 5 means **no** tens, and the other 0 shows there are **no** ones.

5. What does the number 800 mean? 8 hundreds no tens no ones the number 600? 6 hundreds no tens no ones

6. The number 370 means 3 hundreds 7 tens **no** ones. You read it **three hundred seventy.** What does the the 0 in 370 show? No ones

7. The number 307 means 3 hundreds **no** tens 7 ones. You read it **three hundred seven.** What does the 0 in 307 show? No tens

Let pupils demonstrate numbers as suggested on page 55. Provide square materials (cardboard sheets and strips similar to picture above) for pupils to use in showing numbers. Have them also use place-value pocket chart.

Do You Understand These Numbers?

Read each number. Tell what number goes in each space:

1. 256 means ..2. hundreds ..5. tens ..6 ones.

2. 734 means ..7. hundreds ..3. tens ..4 ones.

3. 860 means ..8. hundreds ..6. tens ..0 ones.

4. 407 means ..4. hundreds ..0. tens ..7 ones.

5. 900 means ..9. hundreds ..0. tens ..0 ones.

Write the number with figures that means:

6. 5 hundreds 3 tens 8 ones 538 7 tens 4 ones 74

7. 9 hundreds 5 tens 0 ones 950 3 tens 5 ones 35

8. 3 hundreds 0 tens 4 ones 304 9 tens 0 ones 90

9. 7 hundreds 0 tens 0 ones 700 6 tens 9 ones 69

10. 4 hundreds 6 tens 7 ones 467 4 tens 0 ones 40

11. two hundred nineteen 219 four hundred sixty 460

12. five hundred fifty-four 554 six hundred twelve 612

13. one hundred fourteen 114 nine hundred 900

Seven hundred twenty-eight three hundred fifty eight hundred

14. Read these numbers: 728 904 350 615 800

nine hundred four six hundred fifteen

15. Tell how many hundreds, tens, ones there are in each number in exercise 14. 7 hundreds 2 tens 8 ones; 9 hundreds 4 ones; 3 hundreds 5 tens; 6 hundreds 1 ten 5 ones; 8 hundreds

16. What is the smallest number of 3 places? 100

17. What is the largest number of 3 places? 999

18. Using the figures 3, 7, and 6, write the largest number 763 you can; the smallest number you can. 367

Have pupils show numbers on place-value diagram. Let different pupils demonstrate numbers on abacus, while class writes number shown. Give much practice on showing numbers in three ways, stressing tens nature of system.

Present the addition of 2-place numbers in which the sum of the tens figures is more than 9.

Checking Addition

1. Problem The school busses took 84 children to the park yesterday. Today they took 92 children there. How many children went to the park? 176

Explanation When you add, begin at the bottom and add up. Think, "2 ones and 4 ones are 6 ones." Write 6 in ones place. Then think, "9 tens and 8 tens are 17 tens." 17 tens means 1 hundred and 7 tens. Write 1 in hundreds place and 7 in tens place. The answer is 176. So 176 children went to the park.

$$\begin{array}{r} 84 \\ +\,92 \\ \hline 176 \end{array}$$

You see that the answer is a 3-place number. The sum of the figures in tens place is more than 9. When this happens, you have three places in the answer.

To check the work, add the numbers again. Begin at the top and add down. Think, "4 ones and 2 ones are 6 ones." Then think, "8 tens and 9 tens are 17 tens." The sum is 176, so the work is right.

Add these numbers. Check your work:

2.	75	44	52	83	64	74	22	86
	61	61	57	91	55	83	83	83
	136	105	109	174	119	157	105	169
3.	13	84	76	91	72	63	58	72
	95	74	31	97	76	72	61	85
	108	158	107	188	148	135	119	157
4.	76	92	53	63	95	81	67	92
	72	84	66	44	83	74	61	12
	148	176	119	107	178	155	128	104
5.	81	67	33	85	61	84	51	95
	98	62	73	82	73	22	52	94
	179	129	106	167	134	106	103	189

More Practice. See ⑥ on page 314.

Discuss fully the explanation of ex. 1, emphasizing that 9 tens and 8 tens are 17 tens, or 1 hundred and 7 tens. Illustrate with an abacus if one is available. Have pupils explain some of the examples using a place-pocket chart.

Introduce subtraction of 2-place numbers from 3-place numbers where the differences are less than 100.

Checking Subtraction

1. Problem Jack has 158 stamps. Bill has 84 stamps. How many fewer stamps has Bill than Jack? 74

Explanation In this problem you must subtract a two-place number from a three-place number.

$$\begin{array}{r}158\\-84\\\hline 74\end{array}$$

Think, "4 ones from 8 ones, 4 ones." Write 4 in ones place. Remember that 1 hundred and 5 tens are the same as 15 tens. Think, "8 tens from 15 tens, 7 tens." Write 7 in tens place. The answer is 74. So Bill has 74 fewer stamps than Jack.

To check the work, add the answer, 74, to 84 and see if the sum is 158. Add up and think, "4 ones and 4 ones are 8 ones. 7 tens and 8 tens are 15 tens." You find the sum is 158, so the work is right.

Subtract these numbers and check your work:

2.	168 82 86	157 86 71	135 61 74	174 92 82	119 56 63	126 63 63
3.	103 22 81	136 71 65	109 63 46	187 92 95	109 95 14	108 54 54
4.	116 65 51	105 43 62	159 71 88	105 34 71	178 83 95	148 76 72
5.	179 87 92	127 64 63	168 87 81	136 74 62	104 73 31	157 73 84
6.	186 92 94	159 84 75	117 55 62	104 81 23	135 62 73	179 98 81

More Practice. See ⑦ on page 315.

To the Teacher. See page 328 for the additive method of subtraction.

Explain ex. 1 by showing 158 as 15 tens and 8 ones, and 84 as 8 tens and 4 ones. Then proceed with the subtraction. Have pupils explain how to do some of the examples in this way. Stress that ones are subtracted from ones, tens from tens.

Test ability to distinguish between addition and subtraction concepts in word problems.

Do You Add or Subtract?

Tell whether you should add or subtract in each of these problems. Then work the problem:

1. In the park 6 boys and 5 girls are waiting to ride a pony. How many children are waiting to take a ride? 11

2. A ride on the pony costs 25¢. Last year a ride cost 14¢. This year how much more does a ride cost than last year? 11¢

3. Ann had 3 dolls. Her mother gave her 2 more. How many dolls did Ann have then? 5

4. Jack had a dime. He spent 5 cents for a pencil. How much money did he have left? 5¢

5. Betty had 36 cookies ready to bake. She is baking 24 of them now. How many more cookies does she have to bake? 12 24 + . ? . 12 = 36   . ? . 12 = 36 − 24

6. In the summer Peter read 6 books. Dick read only 4 books in the same time. How many fewer books did Dick read than Peter? 2

7. Susan picked up 3 red leaves, 4 yellow leaves, and 2 brown leaves. How many leaves did she pick up? 9

8. Billy spent 15¢ for candy and 44¢ for a ticket to the movies. How much did he spend for both? 59¢

9. Mary sold 5 birthday cards yesterday and 6 cards today. How many has she sold in the two days? 11

Assist poor readers, but have other pupils work independently. Let pupils explain their answers, giving reasons why they added or subtracted. Have them make up and illustrate similar problems for others to solve; put these in scrapbooks.

Suggestion: Assign this page first as a written test of acquired knowledge; then review it orally.

Yes or No?

Read each question and answer it "Yes" or "No." Can you give a reason for your answer?

1. Will 10 pennies buy as much as 1 dime? Yes
2. Is 39 the number that means 9 tens 3 ones? No
3. Do a dime and a nickel make 20 cents? No
4. Are 100 and 101 the next two numbers after 99? Yes
5. Is a dime more than 3 nickels? No
6. Is 57 a larger number than 75? No
7. Do you subtract to find how much 15 less 7 is? Yes
8. Do you add 8 and 9 to find their sum? Yes
9. Do four and two and three make ten? No
10. Is 11 the smallest two-place number? No
11. Is 99 the largest two-place number? Yes
12. Does 169 mean 16 tens 9 ones? Yes
13. Is 125 the sum of 62 and 63? Yes
14. Does 5 + 5 have the same sum as 7 + 3? Yes
15. Is 19 the way to write the number nineteen? Yes
16. Is 80 the number that means 8 tens 0 ones? Yes
17. Do fifty-one and fifty-one make ninety-two? No
18. Do you add to find how much less 3 is than 8? No
19. Do 7 nickels make more than 40 cents? No
20. Do 6 + 5 and 5 + 6 have the same sum? Yes
21. Do you add when you put two groups together? Yes

Give specific instructions on how to write answers for this form of objective test. Do a few examples orally to get the pupils started writing "Yes" and "No" answers. Later, in oral work, have pupils explain and give numerical answers.

Introduce pupils to the procedure of adding 9 to a number by regrouping the addends as 10 and 1 less than that number.

Adding 9 and a Number

1. The first picture shows 9 beads and 3 beads.

The second picture shows 1 of the group of 3 beads moved over with the other group.

This shows that 9 and 3 = 10 and .2. .
Since 10 + 2 = 12, then 9 + 3 = .12.
How many are 3 + 9? 12 9 + 3? 12

$$\begin{array}{r}10\\+2\\\hline 12\end{array} \quad \text{so} \quad \begin{array}{r}9\\+3\\\hline ??\end{array}$$

2. Use real pennies or play pennies for this. Show that 9 pennies and 6 pennies are the same as 10 pennies and 5 pennies, or .15. pennies. How many are 9 and 6? 15 How many are 6 + 9? 15

$$\begin{array}{r}9\\+6\\\hline 15\end{array} \quad \begin{array}{r}6\\+9\\\hline 15\end{array}$$

Emphasize this generalization by illustrating with objects.

To add 9 and 6, take 1 from 6, which gives 5.
Then add 10, which gives 15.

3. Show that 9 apples and 4 apples are the same as 10 apples and . 3. apples, or .13. apples. How many are 9 and 4? 13 How many are 4 + 9? 13

$$\begin{array}{r}9\\+4\\\hline 13\end{array} \quad \begin{array}{r}4\\+9\\\hline 13\end{array}$$

4. Draw 9 dots. Then draw 5 more dots. Show that 9 dots and 5 dots are the same as 10 dots and . 4 . dots, or . 14. dots. How many are 9 and 5? 14 How many are 5 + 9? 14

First demonstrate ex. 1-3, using such objective materials as a bead frame or play money, as pupils work with similar materials at their seats. Write discoveries as: 9 + 5 = 10 + 4 = 14.

5. Show that 9 and 7 are the same as 10 and . .6., or . .16. How many are 9 and 7? 16 How many are 7 and 9? 16

$$\begin{array}{r} 9 \\ +7 \\ \hline 16 \end{array} \qquad \begin{array}{r} 7 \\ +9 \\ \hline 16 \end{array}$$

Be sure principle is well understood before explaining following.

A quick way to add 9 and 7 is like this: Look at 7 and think "6." Then say "16." Sixteen means 6 and 10. Teen means 10.

6. Show that 9 pennies and 2 pennies are the same as 10 pennies and 1 penny. How many are 9 and 2? 11 How many are 2 + 9? 11

$$\begin{array}{r} 9 \\ +2 \\ \hline 11 \end{array} \qquad \begin{array}{r} 2 \\ +9 \\ \hline 11 \end{array}$$

7. How many are 9 and 9? 18 How many are 9 and 8? 17 You studied these facts on pages 42 and 45.

8. Try to remember the new facts in exercises 1 to 6.

Tell the answers:

9. 9 and 7 are the same as 10 and . .6., or . .16.

10. 9 and 6 are the same as 10 and . .5., or . .15.

11. 9 and 4 are the same as 10 and . .3., or . .13.

12. 9 and 5 are the same as 10 and . .4., or . .14.

13. 9 + 6 = 10 + . .5., or . .15. 6 + 9 = . .15.

14. 9 + 7 = 10 + . .6., or . .16. 7 + 9 = . .16.

15. 9 + 3 = 10 + . .2., or . .12. 3 + 9 = . .12.

16. 9 + 5 = 10 + . .4., or . .14. 5 + 9 = . .14.

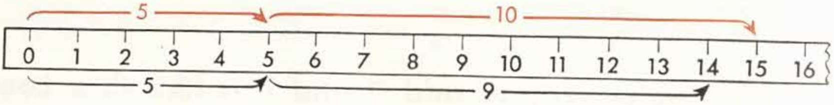
17. 9 + 4 = 10 + . .3., or . .13. 4 + 9 = . .13.

Let pupils demonstrate facts, using objects. Have them also use number line to show that 9 and 7 are same as 10 and 6. After principle is fully understood, show how to add numbers mentally, as in box above.

Introduce another way to add 9 to a number by adding 10 to the number and then taking away 1.

Another Way to Add 9 to a Number

1. This picture shows another way to add 9 to a number.



The red lines show that 5 and 10 are $\overset{15}{\dots}$. Since 9 is 1 less than 10, the black lines show that

$$5 + 9 = 5 + 10 - 1 = 15 - 1 = \overset{14}{\dots}.$$

Tell these answers:

2. 6 and 10 are $\overset{16}{\dots}$, so 6 and 9 are $\overset{15}{\dots}$.

3. 3 and 10 are $\overset{13}{\dots}$, so 3 and 9 are $\overset{12}{\dots}$.

4. 8 and 10 are $\overset{18}{\dots}$, so 8 and 9 are $\overset{17}{\dots}$.

5. $7 + 10 = \overset{17}{\dots}$, so $7 + 9 = \overset{16}{\dots}$. $9 + 7 = \overset{16}{\dots}$.

6. $2 + 10 = \overset{12}{\dots}$, so $2 + 9 = \overset{11}{\dots}$. $9 + 2 = \overset{11}{\dots}$.

7. $4 + 10 = \overset{14}{\dots}$, so $4 + 9 = \overset{13}{\dots}$. $9 + 4 = \overset{13}{\dots}$.

8. $9 + 10 = \overset{19}{\dots}$, so $9 + 9 = \overset{18}{\dots}$. $9 + 9 = \overset{18}{\dots}$.

Emphasize this generalization.

To add 9 to a number, add 10 and take away 1.

Add these numbers:

9. 9 and 3 are $\overset{12}{\dots}$. $3 + 9 = \overset{12}{\dots}$. $9 + 7 = \overset{16}{\dots}$.

10. 5 and 9 are $\overset{14}{\dots}$. $9 + 5 = \overset{14}{\dots}$. $4 + 9 = \overset{13}{\dots}$.

11. 9 and 8 are $\overset{17}{\dots}$. $9 + 9 = \overset{18}{\dots}$. $8 + 9 = \overset{17}{\dots}$.

12. 6 and 9 are $\overset{15}{\dots}$. $9 + 7 = \overset{16}{\dots}$. $9 + 6 = \overset{15}{\dots}$.

Demonstrate ex. 1 on a number line and also with objective materials. Lead pupils to see that 5 + 9 is 1 less than 5 + 10. Have pupils explain ex. 2-8 using counters. Have pupils make fact cards for those facts they should practice regularly.

1. There were 9 boys and 9 girls in the school bus. How many children were in the bus? 18

2. At the first stop 9 girls and 2 boys got off the bus. How many children got off the bus at the first stop? 11

3. Yesterday there were 9 girls and 5 boys in the bus when it left school. How many children left school in the bus yesterday? 14

4. Show that 9 and 8 are the same as 10 and . .7., or .17. You have studied 9 and 8 before this. On what page was it? 45 You have also studied 9 and 9. Where was it? Page 42

Find these sums:

5.	9 + 7 16	5 + 9 14	9 + 3 12	4 + 9 13	9 + 6 15
6.	9 + 4 13	9 + 9 18	2 + 9 11	9 + 8 17	3 + 9 12
7.	6 + 9 15	9 + 2 11	8 + 9 17	9 + 5 14	7 + 9 16

Add these numbers: If pupil forgets fact, remind him of ways he can discover sum (pages 62-64).

8.	9	5	9	2	9	9	9	8	6
	3	9	9	9	7	1	4	9	9
	12	14	18	11	16	10	13	17	15
9.	8	1	2	4	5	9	9	9	3
	9	9	9	9	9	6	9	5	9
	17	10	11	13	14	15	18	14	12
10.	9	4	9	9	6	9	9	9	7
	6	9	5	7	9	8	2	3	9
	15	13	14	16	15	17	11	12	16

Urge pupils to speed up response. Have pupils make up original problems, using facts, for class to solve.

Review column addition, addition and subtraction patterns through problem unit (pages 66-67).

Fun in the Park

1. Last week Jack's father took 9 girls and 9 boys to the park. How many children all together went to the park with Jack's father? 18

2. They saw 11 bears in all in the park. There were 6 white bears. The other bears were brown. How many brown bears did the children see? 5

3. In cages the children saw 9 large monkeys and 5 small monkeys. How many monkeys did they see? 14 How many more large monkeys than small ones were there in the cages? 4

Arouse interest in problems through pictures, discussion of pupils' visits to park, and so on. Remind pupils to read problems carefully to determine what problem asks them, what facts are known, what process to use.

4. The children counted 15 birds in one cage. There were 7 birds with long tails. The others had short tails. How many birds in that cage had short tails? 8

5. Last year there were 3 lions in the park. Now there are 5 lions. How many more lions are there this year than last year? 2 How many fewer lions were there last year than this year? 2

6. There is a small farm at the park. The children saw 2 goats, 2 sheep, and 5 pigs on the farm. How many farm animals did the children see? 9

7. At the park 7 boys and 6 girls had rides on a pony. How many children had pony rides? 13

8. Jack had 75¢ to spend when he went to the park. He spent 63¢ all together. How much money did Jack have left? 12¢

Have children give reasons why they added or subtracted. Let them verify answer with counters or diagrams at board.

Provide oral review of addition and subtraction facts taught thus far, and of place value.

Oral Practice

Give the answers:

1. 6 and 6 are .12., so 6 and 7 are .13.

2. 8 and 8 are .16., so 8 and 9 are .17.

3. 7 and 7 are .14., so 8 and 7 are .15.

4. 5 and 5 are .10., so 5 and 6 are .11.

5. 9 and 6 are the same as 10 and .5., or .15.

6. 9 and 3 are the same as 10 and .2., or .12.

7. 9 and 8 are the same as 10 and .7., or .17.

8. 9 and 4 are the same as 10 and .3., or .13.

9. 9 and 7 are the same as 10 and .6., or .16.

10. 9 and 5 are the same as 10 and .4., or .14.

11. $7 + 6 =$ 13 $6 + 7 =$ 13 $13 - 7 =$ 6 $13 - 6 =$ 7

12. $6 + 5 =$ 11 $5 + 6 =$ 11 $11 - 6 =$ 5 $11 - 5 =$ 6

13. $7 + 8 =$ 15 $8 + 7 =$ 15 $15 - 7 =$ 8 $15 - 8 =$ 7

14. $8 + 9 =$ 17 $9 + 8 =$ 17 $17 - 8 =$ 9 $17 - 9 =$ 8

15. Tell what the number 85 means. 8 tens 5 ones

16. Tell what the number 285 means. 2 hundreds 8 tens 5 ones

17. Tell what number means 3 hundreds 4 tens 9 ones. 349

1 hundred 7 tens 5 ones or 17 tens 5 ones

18. Tell in two ways what the number 175 means.

19. 8 and .7. are 15. 6 and .6. are 12.

20. 9 and .9. are 18. 7 and .6. are 13.

21. 7 and .7. are 14. 6 and .5. are 11.

22. 8 and .9. are 17. 8 and .8. are 16.

Spot-check for individual or class weaknesses. Let pupils use fact cards with partners for further practice. In ex. 15-18 let pupils show answers using pocket chart and abacus.

Evaluate pupil performance in problems involving addition and subtraction. Extend column addition with sums greater than 10.

Problems and Practice

1. How many are 3 cents, 4 cents, and 3 cents? 10¢

2. Tom gave a paper hat to each child at his birthday party. There were 4 red hats, 4 yellow hats, and 2 blue hats. How many paper hats were there? 10

3. Susan has 2 yellow birds and 4 puppies. How many pets in all has she? 6

4. Jack spent 45¢ for a picture book. Then he paid 12¢ to ride home on the bus. How much money did Jack spend? 57¢

5. Betty saved 58¢ last week. She can save only 35¢ this week. How much less will Betty save this week than last? 23¢

6. Dick made 3 paper airplanes. Bill made 4 and Peter made 2. How many planes did the three boys make? 9

7. Mary paid 9¢ for paper and 8¢ for pencils. How much did Mary spend all together? 17¢

8. The boys are making tickets for the school play. They need 85 tickets. They have made 32 of them. How many more must they make? 53

Add these numbers and check your work:

9.	3	8	7	6	5	4	6	4	8
	6	1	2	3	4	3	2	5	1
	3	6	4	3	5	6	7	4	8
	12	15	13	12	14	13	15	13	17
10.	6	7	2	8	7	6	5	4	6
	3	2	4	1	2	1	4	2	3
	4	5	5	7	6	8	2	7	2
	13	14	11	16	15	15	11	13	11

More Practice. See ⑧ on page 315.

Remind pupils to read problems carefully (see page 66). Be sure pupils understand "unseen number" (partial sum of first and second addends) in column addition. Assign "More Practice" to pupils who hesitate.

Present 12 subtraction facts corresponding to addition facts for 9's.

More New Subtraction Facts

1. You have learned that you can make 2 subtraction facts from an addition fact. The dots above show that 9 + 5 = . 14 . From this addition fact you can make the two subtraction facts: 14 − 9 = . 5 . and 14 − 5 = . 9 .

$$\begin{array}{r}14\\-9\\\hline 5\end{array}\qquad\begin{array}{r}14\\-5\\\hline 9\end{array}$$

2. Here are 16 stars. Cover 7 stars. How many stars are not covered? 9 This shows that 7 from 16 is . 9 . Begin again. Now cover 9 stars. How many stars are not covered? 7 This shows that 9 from 16 is . 7 . 16 − 7 = . 9 . and 16 − 9 = . 7 .

$$\begin{array}{r}16\\-7\\\hline 9\end{array}\qquad\begin{array}{r}16\\-9\\\hline 7\end{array}$$

3. Put 12 pencils on the table. Now take away 9 pencils. How many pencils are left? 3 This shows that 9 from 12 is . 3 . Put all 12 pencils on the table again. Take away 3 pencils. How many are left? 9 This shows that 3 from 12 is . 9 . 12 − 9 = . 3 . and 12 − 3 = . 9 .

$$\begin{array}{r}12\\-9\\\hline 3\end{array}\qquad\begin{array}{r}12\\-3\\\hline 9\end{array}$$

Tell what numbers should go in the spaces:

4. 9 from 14 is . 5 . because 9 and . 5 . are 14.
5. 9 from 12 is . 3 . because 9 and . 3 . are 12.
6. 9 from 16 is . 7 . because 9 and . 7 . are 16.
7. 5 from 14 is . 9 . because 5 and . 9 . are 14.

Use objects to show addition fact first, by combining groups. Then demonstrate related subtraction facts. Let pupils use objects as they follow demonstration. Have pupils show facts in semiconcrete form.

8. Here are 13 stars. Cover 4 stars. How many stars are left? 9 4 stars from 13 stars leaves how many stars? 9 4 from 13 is how many? 9 Begin again. Now cover 9 stars. How many stars are left? 4 9 stars from 13 stars leaves how many stars? 4 9 from 13 is how many? 4

$\begin{array}{r}13\\-4\\\hline 9\end{array}$ $\begin{array}{r}13\\-9\\\hline 4\end{array}$

9. Here are 15 dots. Cover 6 dots. How many dots are not covered? 9 6 dots from 15 dots leaves how many dots? 9 6 from 15 is how many? 9 Begin again. Now cover 9 dots. How many dots are not covered? 6 9 dots from 15 dots leaves how many dots? 6 9 from 15 is how many? 6

$\begin{array}{r}15\\-6\\\hline 9\end{array}$ $\begin{array}{r}15\\-9\\\hline 6\end{array}$

10. Here are 11 bells. Cover 2 bells. How many bells are not covered? 9 2 bells from 11 bells leaves how many bells? 9 2 from 11 is how many? 9 Begin again. Now cover 9 bells. How many bells are not covered? 2 9 bells from 11 bells leaves how many bells? 2 9 from 11 is how many? 2

$\begin{array}{r}11\\-2\\\hline 9\end{array}$ $\begin{array}{r}11\\-9\\\hline 2\end{array}$

Give the answers:

11. $\begin{array}{r}16\\-7\\\hline 9\end{array}$ $\begin{array}{r}13\\-9\\\hline 4\end{array}$ $\begin{array}{r}15\\-6\\\hline 9\end{array}$ $\begin{array}{r}11\\-2\\\hline 9\end{array}$ $\begin{array}{r}16\\-9\\\hline 7\end{array}$ $\begin{array}{r}14\\-5\\\hline 9\end{array}$ $\begin{array}{r}12\\-9\\\hline 3\end{array}$ $\begin{array}{r}15\\-9\\\hline 6\end{array}$

Follow procedure for page 70. See suggestions for pages 43, 48, 49. Demonstrate facts in other problems about objects or pupils in class. Be sure "from" is well understood.

Review and relate addition and subtraction facts with 9's.
Help pupils interpret Paula's method in ex. 7-8.

More Help in Subtracting 9

Tell what numbers should be put in the spaces:

1. 9 and .5.. are 14, so 9 from 14 is .5..

2. 9 and .7.. are 16, so 9 from 16 is .7..

3. 9 and .3.. are 12, so 9 from 12 is .3..

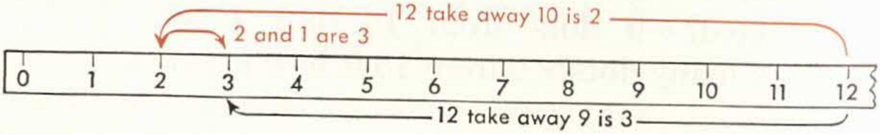
4. 2 and .9.. are 11, so 2 from 11 is .9..

5. 8 and .9.. are 17, so 8 from 17 is .9..

6. 9 and .4.. are 13, so 9 from 13 is .4..

7. When Paula forgets how to subtract 9, she thinks: "I will first take away 10, which is easy. Since I have taken away 1 too many, I will then add 1."

Paula drew this picture to show that her way works for 12 − 9.



8. Try Paula's way of subtracting for 11 − 9; for 15 − 9. 11 − 10 = 1, so 11 − 9 = 1 + 1 = 2.
15 − 10 = 5, so 15 − 9 = 5 + 1 = 6.

Copy and write the answers:

9.	9	7	3	17	12	13	16	14
	+6	+9	+9	−9	−9	−4	−9	−5
	15	16	12	8	3	9	7	9
10.	9	9	9	13	15	11	12	18
	+4	+8	+5	−9	−9	−2	−3	−9
	13	17	14	4	6	9	9	9
11.	9	6	2	16	14	10	17	15
	+9	+9	+9	−7	−9	−1	−8	−6
	18	15	11	9	5	9	9	9

When pupils understand how to "think" the answers, encourage them to speed up responses by learning number facts thoroughly. Have pupils make cards, write problems for facts on which they hesitate.

Provide more experiences with subtraction facts. Review the subtraction of 2-place numbers from 3-place numbers.

Problems and Practice

Give the answers:

1. 12 − 9 = 3 13 − 7 = 6 15 − 9 = 6 12 − 6 = 6
2. 14 − 9 = 5 17 − 9 = 8 16 − 8 = 8 11 − 2 = 9
3. 18 − 9 = 9 15 − 8 = 7 12 − 3 = 9 16 − 9 = 7
4. 11 − 5 = 6 13 − 9 = 4 11 − 9 = 2 11 − 6 = 5
5. 15 − 6 = 9 14 − 7 = 7 16 − 7 = 9 17 − 8 = 9
6. 13 − 4 = 9 13 − 6 = 7 14 − 5 = 9 15 − 7 = 8

7. Jim sold 125 papers yesterday. Today he sold only 94 papers. How many more papers did Jim sell yesterday than today? 31

8. Ann's new story book has 176 pages. Ann has read 92 pages so far. How many more pages has she still to read? 84

9. Today Bill rode 157 miles with his father. By lunch time they had gone 85 miles. How many miles did they ride after lunch? 72

Subtract these numbers and check your work:

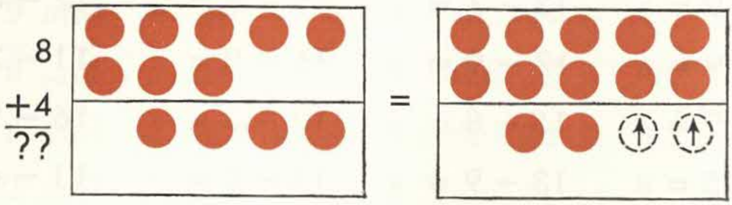
10.	178 84 94	138 67 71	145 94 51	157 66 91	126 95 31	169 85 84
11.	119 56 63	157 74 83	139 41 98	185 93 92	149 58 91	126 34 92
12.	168 72 96	117 62 55	158 86 72	134 92 42	174 81 93	134 73 61
13.	109 32 77	178 95 83	169 97 72	145 72 73	157 93 64	118 63 55

To check thinking procedures, have pupils do ex. 1–9 orally. Remind them in ex. 7–13 that ones are subtracted from ones, tens from tens. Stress meaning of minuend: 178 = 17 tens 8 ones.

Teach the eight addition facts involving 8 as an addend. Introduce pupils to procedure for adding 8 mentally.

Adding 8 to a Number

1. This picture shows that $8 + 4 = 10 + 2$. Can you tell how 8 and 4 are changed to 10 and 2?



$\begin{array}{r}10\\+2\\\hline 12\end{array}$

Since $10 + 2 = 12$,

then $8 + 4 =$. 12.,

and $4 + 8 =$. 12.

$\begin{array}{r}8\\+4\\\hline 12\end{array}$ $\begin{array}{r}4\\+8\\\hline 12\end{array}$

2. Use pennies or pencils for this. Show that 8 and 5 are the same as 10 and . 3 ., or 13. . How many are 8 and 5? 13 How many are 5 and 8? 13

$\begin{array}{r}8\\+5\\\hline 13\end{array}$ $\begin{array}{r}5\\+8\\\hline 13\end{array}$

Emphasize as a good way to find sums mentally.

To add 8 and 5, take 2 from 5, which gives 3. Then add 10, which gives 13.

3. Use pennies or pencils for this. Show that 8 and 3 are the same as 10 and . 1. ., or . 11 . How many are 8 and 3? 11 How many are 3 and 8? 11

$\begin{array}{r}8\\+3\\\hline 11\end{array}$ $\begin{array}{r}3\\+8\\\hline 11\end{array}$

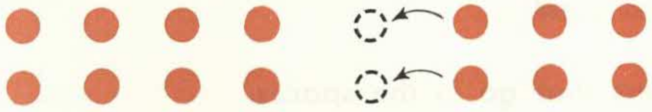
Tell what numbers go in the spaces:

4. 8 and 5 are the same as 10 and . 3. ., or . 13 .

5. 8 and 4 are the same as 10 and . 2. ., or . 12 .

6. 8 and 3 are the same as 10 and . 1. ., or . 11 .

Have the slower pupils work with counters as they study the principle. Brighter pupils might be asked to write such number sentences as: $8 + 4 = 8 + (2 + 2) = (8 + 2) + 2 = 10 + 2 = 12$. Explain the meaning of the parentheses. See Teacher's Guide.



7. Above are 8 dots and 6 dots. Take 2 dots from the 6 dots and put them with the 8 dots. Then there are 10 dots and . .4. . dots. $8 + 6 = 10 + .\,4\,.$, or .14. .

$$\begin{array}{r} 8 \\ +6 \\ \hline 14 \end{array} \qquad \begin{array}{r} 6 \\ +8 \\ \hline 14 \end{array}$$

8. 8 and 7 are the same as 10 and .5. ., or 15. .

9. 8 and 9 are the same as 10 and .7. ., or 17. .

10. A quick way to add 8 and 5 is like this: Take 2 from 5 and think "3." Then say "13." What is a quick way to add 8 and 6? Take 2 from 6; think 10 + 4 = 14.

11. Billy spent 8¢ for marbles and 3¢ for candy. How many cents did Billy spend all together? 11¢

12. Sally sold 5 tickets today and 8 tickets on Saturday. How many tickets did she sell in the two days? 13

13. Dick sold 9 tickets today and 8 tickets on Saturday. How many did he sell in all? 17

Add these numbers:

14.	8	8	6	8	9	8	4	2	8
	3	8	8	1	8	7	8	8	6
	11	16	14	9	17	15	12	10	14
15.	5	8	3	7	8	3	8	8	8
	8	6	8	8	4	8	2	9	7
	13	14	11	15	12	11	10	17	15
16.	9	8	8	8	8	7	6	8	1
	8	2	4	3	5	8	8	8	8
	17	10	12	11	13	15	14	16	9

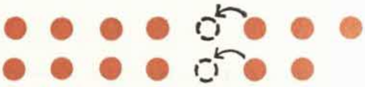
Use illustrative materials to demonstrate ex. 7. Let pupils use counters, if necessary, to verify that 8 and 6 can be regrouped as 10 and 4. Have them demonstrate principle on a number line.

Provide further practice in addition facts taught on pages 74–75.

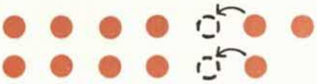
More Practice

Tell the numbers that go in the spaces:

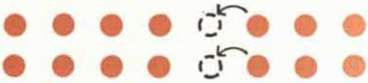
1. $8 + 5 = 10 + 3$, or .13. .
$8 + 5 =$ .13., so $5 + 8 =$ .13. .



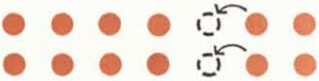
2. $8 + 3 = 10 +$ .1. , or .11. .
$8 + 3 =$ .11., so $3 + 8 =$ .11. .



3. $8 + 6 = 10 +$ .4. , or .14. .
$8 + 6 =$ .14. , so $6 + 8 =$ .14. .



4. $8 + 4 = 10 +$ .2. , or .12. .
$8 + 4 =$ .12. , so $4 + 8 =$ .12. .



5. Peter read 8 books about animals and 5 books about airplanes. How many books did Peter read? 13

6. Mary read 8 books last month and 6 books this month. How many books in all did she read in the two months? 14

7. Jack saw 8 airplanes on the airfield. He also saw 4 airplanes flying. How many planes all together did Jack see? 12

8. Susan had 3¢ in her pocket. Her mother gave her 8¢ this afternoon. How many cents has she now? 11¢

Give the answers:

9. 8 and .5. are 13. $8 +$ .7. $= 15$
10. 8 and .9. are 17. $8 +$ .3. $= 11$
11. 4 and .8. are 12. $8 +$ .8. $= 16$
12. 6 and .8. are 14. $5 +$ .8. $= 13$
13. 2 and .8. are 10. $7 +$ .8. $= 15$

Use magnetic board and discs to demonstrate groupings in ex. 1–4. Have pupils use facts in original problems. Let them verify answers, using principles taught or counters.

Extend pupils' knowledge of coin equivalents to 25¢, 50¢, and $1.
Provide opportunity for pupils to handle and examine coins.

More about Money

Nickel
5¢

Dime
10¢

Quarter
25¢

Half Dollar
50¢

25 cents make 1 quarter.
50 cents make 1 half dollar.
100 cents make 1 dollar.

The sign $ means **dollar** or **dollars.** $5 means 5 dollars.

1. How many cents make 2 dimes and 1 nickel? 25¢

2. How many nickels make 1 quarter? 5 How many nickels make 1 half dollar? 10

3. How many dimes and nickels make 1 quarter? You can have two different answers. 2 dimes and 1 nickel or 1 dime and 3 nickels

4. How many 10's make 100? 10 How many dimes make 100 cents or $1? 10

5. How many cents make a half dollar? 50¢

6. How many quarters make a half dollar? 2

7. How many dimes make a half dollar? 5

8. How many cents make 4 dimes and a nickel? 45¢

9. How many cents make 1 quarter and 1 dime? 35¢

10. How many cents make 1 half dollar and 1 dime? 60¢

11. How many cents make 2 nickels and 3 cents? 13¢

Use real money to demonstrate coin equivalents. Have pupils use toy money to group coins in various ways to make 1 dollar. Let them draw in scrapbooks pictures of coins and write the combined value of the coins.

Teach 8 subtraction facts corresponding to addition facts dealing with 8's. See pages 43, 48, 49, 70, 71 for suggestions.

New Subtraction Facts

1. 8 and ..3.. are 11, so 8 from 11 is ..3..
3 and ..8.. are 11, so 3 from 11 is ..8..
How many are 8 from 11? 3 How many are 3 from 11? 8

11	11
−8	−3
3	8

2. 8 and ..4.. are 12, so 8 from 12 is ..4..
4 and ..8.. are 12, so 4 from 12 is ..8..
How many are 8 from 12? 4 How many are 4 from 12? 8

12	12
−8	−4
4	8

3. 8 and ..5.. are 13, so 8 from 13 is ..5..
5 and ..8.. are 13, so 5 from 13 is ..8..
How many are 8 from 13? 5 How many are 5 from 13? 8

13	13
−8	−5
5	8

4. 8 and ..6.. are 14, so 8 from 14 is ..6..
6 and ..8.. are 14, so 6 from 14 is ..8..
How many are 8 from 14? 6 How many are 6 from 14? 8

14	14
−8	−6
6	8

Subtract these numbers:

5.	14	11	17	15	13	10	16	12
	−6	−8	−9	−8	−8	−2	−8	−4
	8	3	8	7	5	8	8	8
6.	15	12	11	16	10	14	12	11
	−7	−8	−3	−8	−8	−8	−8	−3
	8	4	8	8	2	6	4	8
7.	10	11	13	14	17	14	17	15
	−8	−8	−5	−8	−8	−6	−9	−8
	2	3	8	6	9	8	8	7
8.	17	13	12	10	11	15	13	16
	−8	−8	−4	−2	−3	−7	−5	−8
	9	5	8	8	8	8	8	8

Stress fact that pupil can discover subtraction fact through knowledge of related addition fact.

Provide more practice on subtraction facts taught in Chapter 2.

More Practice

Tell the numbers that go in the spaces:

1. 5 from 13 is ..8.. because 5 and ..8.. are 13.

2. 8 from 14 is ..6.. because 8 and ..6.. are 14.

3. 9 from 17 is ..8.. because 9 and ..8.. are 17.

4. 8 from 11 is ..3.. because 8 and ..3.. are 11.

5. 4 from 12 is ..8.. because 4 and ..8.. are 12.

6. 6 from 14 is ..8.. because 6 and ..8.. are 14.

7. Alice read 11 pages of her book. Ann read 8 pages of her book. How many more pages did Alice read than Ann? 3

8. Dick has saved 8¢. He wants to have 15¢ for a ball. How much more does Dick need to save? 7¢

9. Mary picked 14 flowers. She gave 6 flowers to Betty. How many flowers did Mary have left? 8

10. Jack had 12¢. He spent 4¢ for a lollipop. How many cents did Jack have left? 8¢

Have pupils make individual fact cards for those they are unsure of.

Study these groups of facts:

8 + 3 = 11   3 + 8 = 11   11 − 8 = 3   11 − 3 = 8

8 + 4 = 12   4 + 8 = 12   12 − 8 = 4   12 − 4 = 8

8 + 5 = 13   5 + 8 = 13   13 − 8 = 5   13 − 5 = 8

8 + 6 = 14   6 + 8 = 14   14 − 8 = 6   14 − 6 = 8

8 + 7 = 15   7 + 8 = 15   15 − 8 = 7   15 − 7 = 8

8 + 9 = 17   9 + 8 = 17   17 − 8 = 9   17 − 9 = 8

Do this page orally with pupils. Spot-check for class or individual weaknesses. Have pupils make up original problems. Let different pupils translate them into symbolic language on board. Then have class solve them.

Retest ability to distinguish between addition and subtraction thought patterns. Give practice on addition and subtraction facts.

Do You Add or Subtract?

In each problem first tell whether you add or subtract:

1. There were 83 girls and 75 boys at the school picnic. How many children were there all together? Add; 158*

2. Bill sold 82 papers yesterday. He sold 55 papers today. How many papers in all did he sell? Add; 137

3. Miss White had 144 pencils in a box. She gave the children 62 of them. How many pencils did Miss White have left? Subtract; 82

Give the answers. Watch the signs: Stress.

4.	10 −8 2	13 −8 5	12 −4 8	16 −8 8	9 −8 1	8 +7 15	3 +8 11	8 −6 2
5.	15 −8 7	11 −8 3	10 −2 8	17 −9 8	8 +4 12	9 +8 17	9 −1 8	6 +8 14
6.	12 −8 4	17 −8 9	11 −3 8	13 −5 8	8 −5 3	8 +5 13	4 +8 12	8 +8 16
7.	14 −8 6	15 −7 8	13 −5 8	14 −6 8	8 +9 17	8 −4 4	7 +8 15	5 +8 13

8. Jim has saved 95¢ this week. Ann has saved only 63¢. How much more has Jim saved than Ann? Subtract; 32¢

9. Mr. Brown wants 38 music books for the children. Now he has only 22 music books. How many more music books does he need? Subtract; 16

10. Betty saves pretty buttons. She has 32 large buttons in one box. In another box she has 85 small buttons. How many buttons has Betty in both boxes? Add; 117

*Be sure pupils give complete answer, as 158 children. Urge pupils to write just answers for word problems to develop mental arithmetic skill. Try to speed up responses in ex. 4–7. Aim for automatic response.

Review addition of 2-place numbers. Have pupils show in ex. 6-9 how to change from horizontal to vertical addition form.

Adding Numbers

Find the sums. Check your work:

1.	96	32	72	54	73	85	75
	52	92	97	51	86	93	74
	148	124	169	105	159	178	149
2.	91	67	83	95	64	54	71
	86	72	85	62	55	93	68
	177	139	168	157	119	147	139
3.	83	96	62	43	93	54	65
	72	73	66	94	93	64	91
	155	169	128	137	186	118	156

More Practice. See ⑨ on page 315.

4. Two busses took the boys and girls to the airfield. In one bus were 52 children. In the second bus were 54 children. How many children rode in the busses? 106

5. Ann weighs 75 pounds. Betty weighs 72 pounds. Both girls rode downhill on a sled. How many pounds did the sled carry? 147

Write the three numbers in a column. Add and check:

6. 6 + 3 + 4 13	7 + 2 + 6 15	5 + 4 + 2 11
7. 2 + 7 + 2 11	3 + 6 + 3 12	8 + 1 + 7 16
8. 6 + 1 + 8 15	5 + 2 + 7 14	6 + 3 + 3 12
9. 5 + 4 + 5 14	2 + 3 + 6 11	4 + 2 + 7 13

10. Bill saved $4 one month, $5 another month, and $4 the third month. How many dollars did Bill save in three months? $13

11. In a game Susan got 7 points, 2 points, and 4 points. How many points did Susan have all together? 13

Have pupils demonstrate with a place-pocket chart or abacus that 14 tens is the same as 1 hundred and 4 tens. First ask pupils to do ex. 6-9 mentally. Then have them write the numbers in vertical form.

Teach last four addition facts.

Four New Addition Facts

1. 7¢ and 3¢ are .10.¢, so 7¢ and 4¢ are .11.¢.

2. 7¢ and 4¢ are .11.¢, so 4¢ and 7¢ are .11.¢.

3. 7¢ and 4¢ are .11.¢, so 7¢ and 5¢ are .12.¢.

4. 7¢ and 5¢ are .12.¢, so 5¢ and 7¢ are .12.¢.

5. 7 and 4 are .11. $7 + 4 = .11.$

6. 4 and 7 are .11. $4 + 7 = .11.$

7. 7 and 5 are .12. $7 + 5 = .12.$

8. 5 and 7 are .12. $5 + 7 = .12.$

9. Here are 7 stars and 4 stars:

Put 3 of the 4 stars with the 7 stars, like this:

You see 10 stars and 1 star. This shows that 7 and 4 are the same as 10 and 1, or ..11. How many are 4 and 7? 11

$$\begin{array}{r}7\\+4\\\hline 11\end{array}\qquad\begin{array}{r}4\\+7\\\hline 11\end{array}$$

10. Show that 7 and 5 are the same as 10 and .2., or .12. How many are 7 and 5? 12 How many are 5 and 7? 12

$$\begin{array}{r}7\\+5\\\hline 12\end{array}\qquad\begin{array}{r}5\\+7\\\hline 12\end{array}$$

11. Peter had 7 pennies. Today his mother gave him 4 pennies. How many pennies has he now? 11

12. Sally cut out 5 paper dolls yesterday. Today she cut out 7. How many paper dolls did Sally cut out? 12

13. Joe picked 4 red apples and 7 green apples. How many apples did Joe pick? 11

14. 7 stars and 5 stars are how many stars? 12

Have pupils demonstrate the meaning of the four new facts with objects and by making dot diagrams. Emphasize how the new facts can be related to known addition facts, as in ex. 9 and 10. For example, $7 + 4 = 7 + (3 + 1) = (7 + 3) + 1 = 10 + 1 = 11$.

Relate the four new subtraction facts on this page to the four addition facts on page 82.

Four New Subtraction Facts

$\begin{array}{r}11\\-7\\\hline 4\end{array}$ $\begin{array}{r}11\\-4\\\hline 7\end{array}$

1. 7 and .4. . are 11, so 7 from 11 is .4. .
4 and .7. . are 11, so 4 from 11 is .7. .
How many are 7 from 11? 4 How many are 4 from 11? 7

$\begin{array}{r}12\\-7\\\hline 5\end{array}$ $\begin{array}{r}12\\-5\\\hline 7\end{array}$

2. 7 and .5. . are 12, so 7 from 12 is .5. .
5 and .7. . are 12, so 5 from 12 is .7. .
How many are 7 from 12? 5 How many are 5 from 12? 7

3. 11 − 4 = .7. . 11 − 7 = . .4. 12 − 5 = . 7 .

4. 12 − 7 = .5. . 11 − 4 = . .7. 12 − 7 = . 5 .

5. Peter needs 12¢ for a toy to paint. He has 5¢ now. How much more does he need? 7¢

6. Tom's mother gave him 11 apples. He gave the boys 7 apples. How many apples did he have left? 4

7. Alice bought 12 cookies. The children ate 7 cookies. How many cookies were left? 5

8. Jane saved 11¢. She had found 4¢ and earned the rest. How many cents had Jane earned? 7¢

Have pupils make fact cards for these.

Study these groups of facts:

7 + 4 = 11 4 + 7 = 11 11 − 7 = 4 11 − 4 = 7

7 + 5 = 12 5 + 7 = 12 12 − 7 = 5 12 − 5 = 7

Tell or write the answers:

9. $\begin{array}{r}4\\+7\\\hline 11\end{array}$ $\begin{array}{r}11\\-7\\\hline 4\end{array}$ $\begin{array}{r}12\\-5\\\hline 7\end{array}$ $\begin{array}{r}7\\+4\\\hline 11\end{array}$ $\begin{array}{r}5\\+7\\\hline 12\end{array}$ $\begin{array}{r}12\\-7\\\hline 5\end{array}$ $\begin{array}{r}11\\-4\\\hline 7\end{array}$ $\begin{array}{r}7\\+5\\\hline 12\end{array}$

Emphasize relationships between addition and subtraction facts. Some pupils may need to work with counters in ex. 1-2. Have pupils illustrate new facts with dot or circle diagrams.

Instead of teaching each fact separately, develop the generalization for adding zero to any number.

Zero in Addition

1. The children in Mary's room are playing a game. Each child throws 2 rings at the clown's head. If a ring falls on the floor, it counts **zero.** Zero means **none** or **not any.** You write zero like this: **0.**

2. Mary throws one ring on 5. The second ring falls on the floor. It counts 0. Mary's score is 5 because 5 and 0 are 5.

$$\begin{array}{r} 5 \\ +0 \\ \hline 5 \end{array}$$

3. Jim's first ring falls on the floor. He throws the second ring on 4. What is Jim's score? 4 How many are 0 and 4? 4

$$\begin{array}{r} 0 \\ +4 \\ \hline 4 \end{array}$$

Stress this generalization after discussion.

If you add a number and zero, the sum is the same as that number.

Copy and write the sums in the empty boxes. Add in each direction as on page 25.

4.

12	7	5	0
7	7	0	7
5	0	5	5
0	7	5	12

5.

8	12	9	13
17	8	9	17
4	4	0	4
13	12	9	8

6.

5	9	11	15
6	0	6	6
14	9	5	14
15	9	11	5

Establish readiness for zero in addition through keeping score in games, class attendance, and so forth. Have pupils write sensible problems using zero facts. See that pupils understand how to complete the number patterns in ex. 4–6.

Review addition and subtraction of 2-figure numbers taught in Chapter 2. Prepare for chapter test.

Zero in Subtraction

1. Susan had 9¢. She spent 9¢ for a ball. How many cents did she have left? 0
▸ Susan spent all of her money for the ball. She had no money left. 9 − 9 = 0.

$\begin{array}{r}9\\-9\\\hline 0\end{array}$

2. Jack had 7¢. He spent 7¢ to ride on a bus. How many cents did he have left? No cents How much is 7¢ less 7¢? 0

$\begin{array}{r}7\\-7\\\hline 0\end{array}$

Stress after discussion.

If you subtract a number from itself, the answer is zero.

3. Dick had 4 pennies. He did not spend any pennies. How many pennies did Dick have left? 4 How many are 4 less 0? 4

$\begin{array}{r}4\\-0\\\hline 4\end{array}$

Stress after discussion.

If you subtract zero from a number, the answer is that number.

Tell or write the answers:

4.	$\begin{array}{r}7\\-7\\\hline 0\end{array}$	$\begin{array}{r}2\\-0\\\hline 2\end{array}$	$\begin{array}{r}5\\-0\\\hline 5\end{array}$	$\begin{array}{r}4\\-4\\\hline 0\end{array}$	$\begin{array}{r}6\\-0\\\hline 6\end{array}$	$\begin{array}{r}8\\-8\\\hline 0\end{array}$	$\begin{array}{r}3\\-0\\\hline 3\end{array}$	$\begin{array}{r}9\\-0\\\hline 9\end{array}$
5.	$\begin{array}{r}9\\-9\\\hline 0\end{array}$	$\begin{array}{r}0\\-0\\\hline 0\end{array}$	$\begin{array}{r}3\\-3\\\hline 0\end{array}$	$\begin{array}{r}7\\-0\\\hline 7\end{array}$	$\begin{array}{r}5\\-5\\\hline 0\end{array}$	$\begin{array}{r}8\\-0\\\hline 8\end{array}$	$\begin{array}{r}6\\-6\\\hline 0\end{array}$	$\begin{array}{r}4\\-0\\\hline 4\end{array}$

Lead pupils to generalizations before doing this page. Have pupils write sensible problems for ex. 4–5. Post for reference.

Review addition and subtraction of 2-place numbers taught in Chapter 2. Prepare for chapter test.

Adding and Subtracting

1. At the store Alice spent 45¢ for oranges and 30¢ for apples. How much did Alice spend all together? 75¢

2. Last spring Dick had $35 in the bank. In the summer he put $20 more in the bank. Then how many dollars did Dick have in the bank? $55

Find the sums of these numbers. Check your work: Stress checking.

3.	89	41	63	72	64	84	50
	50	82	93	84	60	64	84
	139	123	156	156	124	148	134
4.	85	73	65	83	90	87	82
	92	75	80	86	47	32	72
	177	148	145	169	137	119	154

Write in columns and add. Check your work:

5. 4 + 4 + 5 13 6 + 0 + 6 12

6. 5 + 3 + 6 14 7 + 0 + 8 15

7. Bill's picture book holds 128 pictures. Bill has put 40 pictures in it. How many more can he put in his book? 88

8. Our teacher had 144 sheets of drawing paper. She gave 80 sheets of it to the girls and boys. How many sheets of drawing paper did she have left? 64

Subtract these numbers. Check your work: Stress checking.

9.	139	118	177	158	146	129
	50	85	82	78	83	46
	89	33	95	80	63	83
10.	146	105	139	115	128	167
	66	84	82	32	84	80
	80	21	57	83	44	87

More Practice. See ⑩ and ⑪ on page 316.

Observe pupils as they work to see if thought patterns are understood and if pupils are proceeding from ones to tens. Use "More Practice" to reteach if necessary.

Add. Give the right answers quickly:

1.	3 6 9	4 4 8	8 2 10	2 3 5	3 4 7	2 6 8	0 9 9	2 1 3	1 8 9	6 0 6
2.	1 7 8	8 0 8	1 1 2	8 7 15	6 3 9	5 5 10	2 2 4	3 8 11	2 4 6	0 1 1
3.	4 3 7	6 6 12	7 3 10	5 1 6	0 6 6	7 1 8	9 8 17	1 3 4	6 4 10	8 8 16
4.	0 5 5	1 4 5	7 9 16	9 0 9	5 2 7	9 7 16	5 3 8	4 0 4	3 2 5	8 5 13
5.	2 9 11	8 1 9	0 4 4	6 9 15	4 7 11	1 6 7	7 0 7	6 5 11	1 5 6	3 7 10
6.	8 3 11	1 0 1	3 9 12	6 7 13	0 0 0	4 6 10	7 7 14	4 1 5	5 0 5	9 9 18
7.	5 4 9	7 5 12	6 2 8	9 1 10	5 6 11	7 4 11	0 3 3	4 8 12	8 9 17	7 2 9
8.	3 3 6	0 7 7	5 8 13	4 2 6	9 6 15	2 0 2	6 8 14	2 5 7	8 4 12	4 5 9
9.	2 7 9	9 5 14	3 5 8	8 6 14	9 2 11	2 8 10	4 9 13	0 8 8	6 1 7	1 2 3
10.	5 7 12	0 2 2	7 6 13	1 9 10	9 4 13	7 8 15	3 0 3	9 3 12	3 1 4	5 9 14

To the Teacher. This page is to be used as a diagnostic test and results are best when it is administered orally to each pupil. These facts should be mastered so thoroughly that the pupil can give all the answers quickly and accurately.

Note errors or hesitancy on individual progress cards. Have pupils also list facts not mastered. Let them use fact cards with partners for further drill.

Test on the Subtraction Facts

Subtract. Give the right answers quickly:

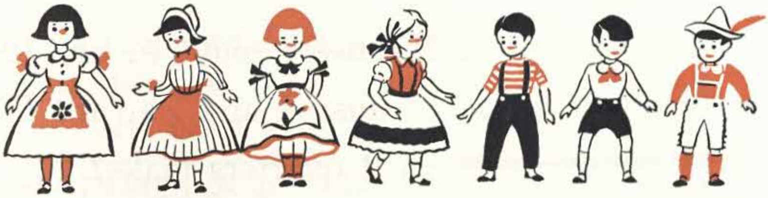
1.	7	5	6	9	8	3	10	10	10	14
	3	5	3	6	4	0	2	7	4	7
	4	0	3	3	4	3	8	3	6	7
2.	9	1	7	8	4	5	12	10	10	10
	2	0	5	8	1	3	6	1	3	5
	7	1	2	0	3	2	6	9	7	5
3.	4	8	9	6	3	9	13	10	14	11
	3	5	7	4	3	0	5	9	8	3
	1	3	2	2	0	9	8	1	6	8
4.	2	7	8	5	7	9	16	15	12	17
	0	7	1	2	6	3	9	7	3	8
	2	0	7	3	1	6	7	8	9	9
5.	3	9	6	5	1	8	10	11	13	12
	1	4	0	4	1	2	6	7	8	7
	2	5	6	1	0	6	4	4	5	5
6.	2	7	2	8	7	13	11	16	12	15
	1	1	2	7	0	4	4	8	4	9
	1	6	0	1	7	9	7	8	8	6
7.	6	9	3	4	6	10	15	11	18	13
	2	9	2	0	5	8	6	8	9	6
	4	0	1	4	1	2	9	3	9	7
8.	4	8	6	8	5	11	13	12	14	11
	2	6	1	3	0	2	9	8	9	5
	2	2	5	5	5	9	4	4	5	6
9.	4	9	8	7	9	17	12	15	11	14
	4	5	0	4	8	9	5	8	9	6
	0	4	8	3	1	8	7	7	2	8
10.	5	0	7	9	6	14	13	11	16	12
	1	0	2	1	6	5	7	6	7	9
	4	0	5	8	0	9	6	5	9	3

To the Teacher. This page is to be used as a diagnostic test. See the suggestions for the test on the addition facts on page 87. Some teachers prefer to make tests on the basic facts by means of flash cards, each card containing one fact.

See suggestions for page 87.

Lead pupils to see that "finding one of the parts" on this page is like finding a missing addend on page 47.

Finding One of the Parts



1. Susan has 7 dolls. She has 4 girl dolls. The rest are boy dolls. How many boy dolls has Susan? 3
   ▶ Count the boy dolls in the picture above. How many are there? 3 A shorter way to find the number of boy dolls is to subtract 4 from 7. Does this give the same answer? 3 boy dolls; yes

2. Jim has 10 pigs. Two of them are black pigs. The others are white. How many white pigs has Jim? 8

3. Mother bought 18 cookies. Nine of them were sugar cookies. The rest were nut cookies. How many nut cookies did Mother buy? 9

4. There were 25 children at Jane's party. 12 of them were girls. How many boys were there? 13

5. Betty picked 15 flowers. 6 were yellow. The rest were blue. How many blue flowers were there? 9

6. Dick has 30 hens. 10 hens are brown. The rest are white. How many white hens has Dick? 20

7. Ann spent 25¢ for ice cream and candy. The ice cream cost 15¢. How much did the candy cost? 10¢

Emphasize and write on class chart (see page 51).

If you know the whole number and one of its parts, you subtract to find the other part of the number.

Demonstrate new pattern first in classroom situations (boys and girls in a row, crayons of different colors, paint supplies, and so on). Lead pupils to realize that finding a part calls for subtraction. Have pupils make up similar problems.

Consult the Teacher's Guide for an explanation of how the test items correlate with the major aims of Chapter 2.

Chapter Review

1. 7 from 12 is . 5 . because 7 and . 5 . are 12.

2. 8 from 11 is . 3 . because 8 and . 3 . are 11.

3. How many cents do 2 quarters make? 50¢

4. How many cents do 2 dimes and 4 pennies make? 24¢

5. 374 means . 3 . hundreds . 7 . tens . 4 . ones.

6. 605 means . 6 . hundreds . 0 . tens . 5 . ones.

Add these numbers and check your work:

7.	5	3	7	8	4	2	6	4
	3	6	1	0	3	6	2	4
	6	2	6	5	5	3	5	4
	14	11	14	13	12	11	13	12
8.	56	92	75	63	84	31	92	40
	93	86	93	72	45	85	63	97
	149	178	168	135	129	116	155	137

9. Take 73 from 127. What is the answer? 54

10. Dick had 118 bags of peanuts to sell. He has sold 45 bags so far. How many more bags does Dick want to sell? 73

11. Susan has 115 cards with flower pictures. She also has 72 cards with bird pictures. How many fewer bird pictures than flower pictures has she? 43

Subtract. Check your work by adding:

12.	76	89	65	149	128	127	179
	54	71	25	63	83	54	96
	22	18	40	86	45	73	83
13.	37	54	98	116	115	147	138
	12	43	72	26	72	60	56
	25	11	26	90	43	87	82

Note individual errors on progress cards. Regroup pupils for reteaching based on individual or class needs.

A Problem Test

1. Betty had 12 paper dolls. She gave 4 of them to Ann. How many did she have left? 8

2. Jim has 178 stamps in his book. Bill has only 95 stamps in his book. How many more stamps has Jim than Bill? 83

3. Susan earned 50¢. Her father gave her a quarter. Has Susan enough money to buy a game for 69¢? 75¢; yes

4. Joe has 12 toy airplanes. There are 3 large ones. The rest are small. How many small planes has Joe? 9

5. On Uncle Jim's farm Peter saw 6 kittens, 3 puppies, and 6 rabbits. How many animals did Peter see? 15

6. Last month Bill saved $9. This month he has saved $6. How much has Bill saved in two months? $15

7. The Green children want to buy a yellow bird that costs $9. They have saved $7 all together. How much more do they need to save? $2

8. There were 43 children in one bus and 46 in another. How many children were in both busses? 89

9. In Sally's room at school there are 35 children. In Mary's room there are 24. How many fewer children are there in Mary's room than in Sally's? 11

10. Mother made 12 little cakes. She gave the children 5 of them. How many cakes did she have left? 7

This is the second Problem Test. How many problems did you have right? Each problem counts 10.

Give reading help to pupils who have difficulty. Urge pupils to read problems carefully to see what must be found, what facts are given, what process must be used, how the problem should be written in numbers.

Assign this diagnostic test of addition and subtraction skills. Recommend further practice on the practice pages indicated.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Page for that row and do the work on that page.

Add these numbers:

								Practice Pages
1.	8 8 16	6 5 11	8 9 17	7 7 14	8 7 15	6 7 13	9 9 18	87
2.	9 7 16	3 9 12	8 4 12	6 9 15	5 8 13	4 7 11	6 8 14	87
3.	5 4 3 12	4 1 6 11	6 3 5 14	5 4 4 13	8 1 5 14	4 3 4 11	5 2 5 12	90
4.	66 41 107	93 96 189	78 50 128	74 94 168	85 44 129	70 62 132		86

Subtract these numbers:

5.	18 9 9	13 7 6	15 8 7	17 8 9	14 7 7	11 6 5	88
6.	12 9 3	14 8 6	13 4 9	16 9 7	11 3 8	14 5 9	88
7.	108 54 54	137 61 76	169 82 87	176 93 83	125 64 61		59
8.	118 92 26	167 95 72	129 36 93	133 42 91	146 94 52		73
9.	139 54 85	158 85 73	127 77 50	145 63 82	114 30 84		86

Urge independent work. Compare results of this test with previous ones (pages 87, 88, 90) as shown on progress records. Plan for reteaching with small groups of pupils as necessary.

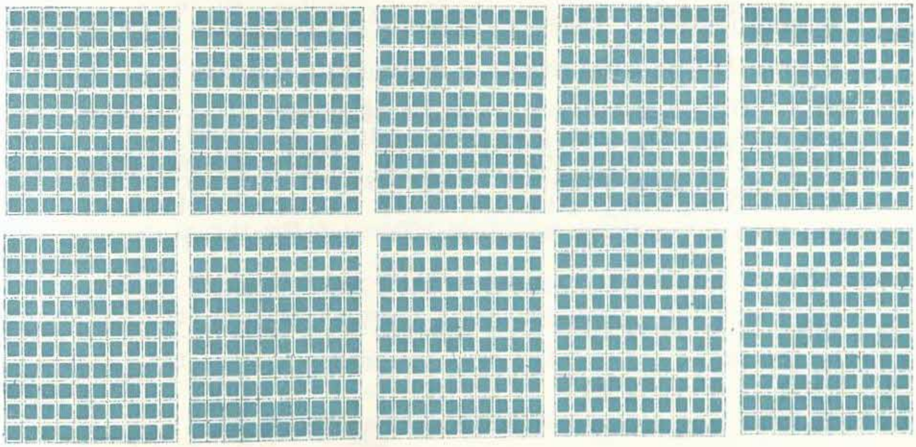
Consult the Teacher's Guide for a discussion of the specific aims of Chapter 3.

Chapter 3

More about Numbers

Extend place-value understanding through thousands.

1. Look at the sheets of stamps below. There are 100 stamps in each sheet. How many stamps are there in all? Count the stamps like this: 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000.



2. You write 10 hundreds like this: 1000. Ten hundreds are the same as one thousand. You see that 1000 has 4 places. The place at the left of hundreds place is **thousands** place. You can read 1000 like this: 1 thousand or 10 hundred. 1 thousand = 10 hundred.

Provide pupils with square material (cardboard sheets of 100 squares, strips of 10 squares, single squares) to use in demonstrating 4-figure numbers. Be sure pupils see that 10 hundreds = thousand. Use abacus and place-value diagram also.

Emphasize the reading and writing of 4-place numbers and the place value of the figures in the various positions.

The Meaning of Numbers

1. Count by hundreds above 1000 like this: 1100, 1200, 1300, 1400, 1500, and so on. You read 1100 like this: **one thousand one hundred** or **eleven hundred.** Read 1200 in two ways. One thousand two hundred, or twelve hundred Read these numbers in two ways: 1400, 1800, 1300, 1900. See Guide.

2. Miss White told the children that there are 1563 children in Hilltop School. Bill said that 1563 means 1000 + 500 + 60 + 3. Another way to tell what 1563 means is to say 1 **thousand** 5 **hundreds** 6 **tens** 3 **ones.**

3. The number 1036 means 1 thousand 0 hundreds 3 tens 6 ones. You read it **one thousand thirty-six,** or **ten hundred thirty-six,** or **ten thirty-six.** The number 1007 means 1 thousand 0 hundreds 0 tens 7 ones. You read it **one thousand seven.** Tell one other way to read 1007. Ten hundred seven

Thousands	Hundreds	Tens	Ones
1	0	3	6
1	0	0	7

4. Read this: Jane was born in 1954. Nineteen fifty-four (nineteen hundred fifty-four) Jack was born in 1953. Nineteen fifty-three (nineteen hundred fifty-three) They live at 1708 Summer Street. Seventeen "o" eight (seventeen hundred eight)

Read these numbers: Also show their meaning on an abacus.

5. 1453 1779 1004 1035 1661

One thousand four hundred fifty-three, or fourteen hundred fifty-three, or fourteen fifty-three. See Guide for other answers for ex. 5-6.

6. 1001 1800 1596 1830 1958

Discuss what the numbers would be without the zeros.

Write these numbers in figures:

7. Fifteen thirty 1530 One thousand four 1004

8. Nineteen hundred fifty 1950 Fourteen hundred 1400

9. Write the year in which you were born.

See the suggestions on page 93. In ex. 3 determine through questions whether pupils understand that although there are no hundreds in hundred's place of 1036, there are 10 hundreds in the given number. Similarly 1007 has 100 tens in all.

Review to maintain skills taught in Chapter 2.

Packing Boxes

1. The children are packing some boxes for Christmas. They packed 80 boxes yesterday. Today they will pack 75 more. How many boxes is that in all? 155

2. The children brought 62 toys for boys and 93 toys for girls. Were there enough toys to put one in each box? See the answer to ex. 1. (Ex. means exercise.) 155 toys; yes

3. The children wanted to put a bag of candy in each box. They had brought only 90 bags. How many more bags did they need? 65

Add these numbers. Check your work:

4.	73	95	61	95	84	33	96	70
	73	13	58	72	61	75	93	83
	146	108	119	167	145	108	189	153
5.	94	46	72	74	52	83	94	50
	55	80	45	83	86	92	24	59
	149	126	117	157	138	175	118	109
6.	67	52	93	62	82	53	65	95
	81	64	86	77	43	74	64	41
	148	116	179	139	125	127	129	136
7.	92	20	47	86	71	94	36	74
	32	80	62	82	96	63	82	62
	124	100	109	168	167	157	118	136

Be sure pupils understand thought patterns in ex. 1-3. Review tens and ones aspect of numbers, as 15 tens is same as 1 hundred and 5 tens.

Teach column addition involving 3-figure numbers and two addends (no carrying).

Adding Three-Place Numbers

1. **Problem** In the Lake School there are 342 children. In the Fox School there are 336 children. How many children are there in both schools? 678

Explanation Write 336 under 342 and add up like this:

Think, "6 ones and 2 ones are 8 ones." Write 8 in ones place.

Think, "3 tens and 4 tens are 7 tens.' Write 7 in tens place.

Think, "3 hundreds and 3 hundreds are 6 hundreds." Write 6 in hundreds place.

Hundreds	Tens	Ones
3	4	2
3	3	6
6	7	8

The sum is 678. There are 678 children in both schools. Check the work by adding down.

Add the numbers. Check your work:

2.	136 260 396	728 131 859	343 503 846	615 370 985	320 512 832	226 373 599
3.	131 104 235	150 610 760	231 245 476	341 658 999	121 352 473	642 152 794
4.	242 432 674	365 124 489	735 203 938	332 263 595	243 614 857	410 404 814
5.	534 221 755	805 104 909	446 351 797	520 303 823	241 123 364	512 174 686

6. Add 460 to each number below:

123 583 336 796 507 967 425 885 216 676 324 784

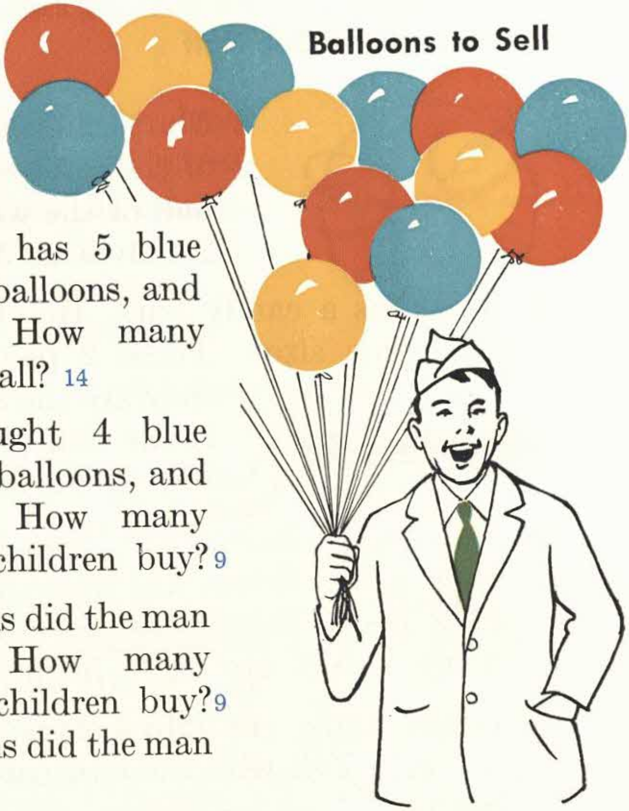
7. Add 302 to each number in ex. 6. 425, 638, 809, 727, 518, 626

More Practice. See ⑫ on page 316.

Have pupils demonstrate some examples as shown in ex. 1. Stress adding ones to ones, tens to tens, hundreds to hundreds. Urge brighter pupils to do ex. 6-7 mentally.

Maintain skill of single-column addition with 3 addends.

Balloons to Sell



1. The balloon man has 5 blue balloons, 4 yellow balloons, and 5 red balloons. How many balloons has he in all? 14

2. The children bought 4 blue balloons, 2 yellow balloons, and 3 red balloons. How many balloons did the children buy? 9

3. How many balloons did the man have at first? 14 How many balloons did the children buy? 9 How many balloons did the man have left? 5

Add. Begin at the bottom of each column and add up. Check your work by adding down: Stress.

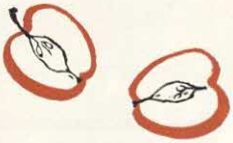
4.	8	2	6	6	8	7	6	7	7
	1	1	2	3	1	2	1	2	2
	3	8	3	5	4	7	5	3	2
	12	11	11	14	13	16	12	12	11
5.	5	5	2	8	4	5	7	4	6
	2	1	6	1	3	2	2	5	3
	5	7	3	6	5	7	6	2	4
	12	13	11	15	12	14	15	11	13
6.	4	7	2	3	5	4	4	6	7
	2	1	5	2	1	0	3	2	2
	7	3	4	6	8	9	4	7	5
	13	11	11	11	14	13	11	15	14

More Practice. See ⑬ on page 317.

Urge pupils to work quickly. They should mentally see the sum of first two addends and add this partial sum to third. Ex. 4-6 could be used as relay race activity at board to speed up response.

Concepts of halves, thirds, and fourths are redeveloped on pages 98-100. Consult Teacher's Guide for suggestions.

Learning about One Half

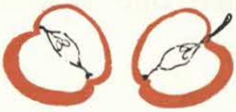


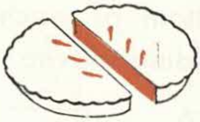
1. Mary cuts an apple into 2 pieces of the same size. Each piece is **one half** of the whole apple. There are 2 **halves** in a whole apple.

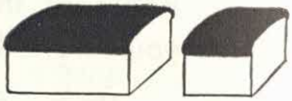
2. Jack has a candy bar. He cuts it into 2 pieces of the same size. These 2 pieces are **equal** because they are the same size. Each piece is one half of the whole candy bar. You write one half like this: $\frac{1}{2}$.

3. How many halves are there in a whole apple? Two How many halves are there in a whole candy bar? Two How many halves are there in a whole pie? Two How many halves are there in any whole thing? Two

4. Is the apple cut into halves? Yes Is the pie cut into halves? Yes Tell why the two parts of the cake are **not** halves. The two parts are not equal in size.





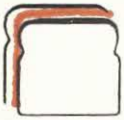


Emphasize this after providing ample demonstrations.

Both halves of anything must be the same size.

Provide many experiences in folding paper into halves. Fold squares, rectangles, triangles, circles, and so on.

5. Here is a picture of a sandwich. Draw two sandwiches like this on your paper. Draw a line across one sandwich so that each part is one half of the sandwich. Draw a line across the other sandwich so that the 2 pieces are not halves.

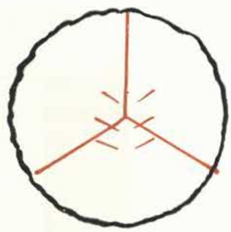


Be sure that pupils understand that half of a whole is one of the two equal parts of the whole. Hence halves of the same whole are equal. Halves of different wholes are not equal unless the wholes are of equal size.

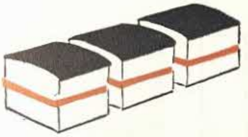
Add new terms (pages 98-100) to class arithmetic vocabulary chart.

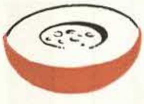
Thirds and Fourths

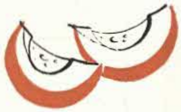
1. Mother made a small pie for Jane. Jane cut the pie into 3 equal pieces. Each piece is **one third** of the pie. You write one third like this: $\frac{1}{3}$. How many thirds are there in a whole pie? 3

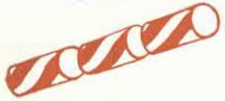


2. Which of these things are cut into **thirds?** The cake and the peppermint stick

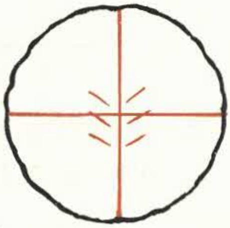








3. This pie is cut into 4 equal pieces. Each piece is **one fourth** or **one quarter** of the pie. You write one fourth like this: $\frac{1}{4}$. How many **fourths** are there in a whole pie? 4

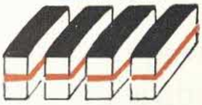


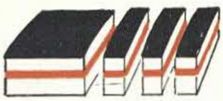
4. How many thirds are there in one whole thing? 3 How many fourths are there in one whole thing? 4

5. Draw two sandwiches as you did on page 98. Draw lines on each one to make 4 equal pieces. Make the pieces of the second sandwich a different shape from those of the first sandwich.

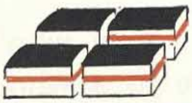
6. Which of these cakes are divided into fourths?

This one

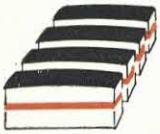




This one



This one

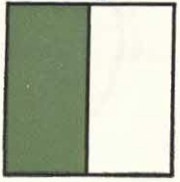


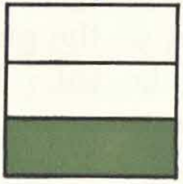
Follow procedure for page 98. Be sure pupils label parts correctly. Let pupils use flannel board to show that 3 thirds make one whole thing, and 4 fourths make one whole thing. Stress equality of parts. Use blackboard for further demonstration.

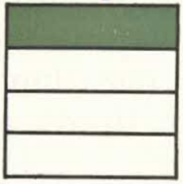
Let pupils begin own fractional parts kit (whole circles or rectangles, halves, thirds, and fourths).

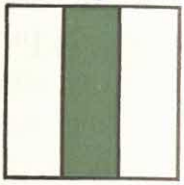
Halves, Thirds, and Fourths

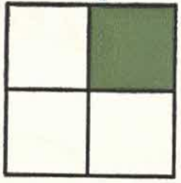
1. Tell what part of each picture is green:

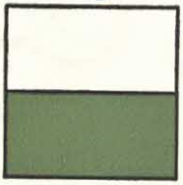
$\frac{1}{2}$

A

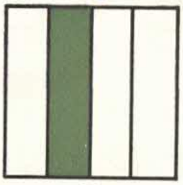
$\frac{1}{3}$

B

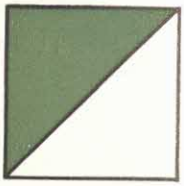
$\frac{1}{4}$

C

$\frac{1}{3}$

D

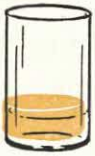
$\frac{1}{4}$

E

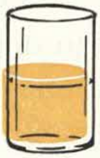
$\frac{1}{2}$

F

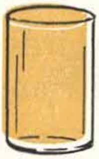
$\frac{1}{4}$

G

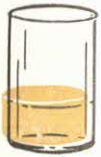
$\frac{1}{2}$

H

2. Which glass is $\frac{1}{3}$ full? The fourth Which glass is $\frac{1}{2}$ full? The second Which one is $\frac{1}{4}$ full? The first Which one is full? The third


$\frac{1}{4}$


$\frac{1}{2}$


full


$\frac{1}{3}$

3. Take a whole sheet of paper and fold it once to show halves. Then fold it again to show fourths.

4. Can you fold the sheet of paper in another way to show halves and fourths? How many ways can you find to do it?

5. How many halves are there in a whole apple? 2 How many halves are there in a whole sandwich? 2

6. How many fourths are there in a whole candy bar? 4 How many fourths are there in a whole pie? 4

Have pupils use own fractional parts to demonstrate that dividing in half means 2 equal parts, in thirds means 3 equal parts, in fourths means 4 equal parts. Have pupils make posters showing labeled fractional parts.

Maintain subtraction skills taught in Chapter 2.

Practice in Subtracting

Give the answers as quickly as you can:

1.	12	14	11	15	13	11	15	11
	−7	−7	−2	−8	−5	−6	−6	−7
	5	7	9	7	8	5	9	4
2.	12	14	17	16	15	11	18	12
	−6	−8	−9	−7	−9	−4	−9	−9
	6	6	8	9	6	7	9	3
3.	10	11	12	17	11	14	13	11
	−7	−8	−5	−8	−9	−9	−7	−3
	3	3	7	9	2	5	6	8

4. How many more are 144 eggs than 60 eggs? 84

5. Subtract \$83 from \$128. How many dollars are left? \$45

6. How much more is 156 than 94? 62

7. How much less is 82 than 127? 45

Subtract these numbers. Check your work: Stress.

8.	65	37	95	138	147	127	169
	34	24	80	97	51	77	75
	31	13	15	41	96	50	94
9.	86	89	48	129	183	149	136
	66	41	35	86	93	63	44
	20	48	13	43	90	86	92
10.	42	79	26	107	135	154	169
	12	59	12	32	82	90	87
	30	20	14	75	53	64	82
11.	88	73	94	145	159	118	137
	32	41	54	95	74	54	63
	56	32	40	50	85	64	74
12.	64	59	88	127	116	129	165
	12	30	18	36	35	42	91
	52	29	70	91	81	87	74

More Practice. See ⑭ on page 317. Use for further review.

Ex. 1-3 should be done quickly. Pupils who still hesitate should use fact cards for further drill. In ex. 4-12 be sure pupils subtract ones from ones, tens from tens.

Present word problems dealing with both addition and subtraction thought patterns. Review "how many more," "how many in all."

Do You Add or Subtract?

First tell whether you add or subtract. Then do the work:

1. Jim is making tickets for a circus. He has 125 tickets to make. So far he has made 70 tickets. How many more has he to make? Subtract; 55

2. Ann made two strings of beads. On the long string she put 73 beads. On the other string she put 41 beads. How many beads in all did Ann use? Add; 114

3. In his pocket Tom has 38¢. Mr. Green will pay him 50¢ for working after school. How much money will Tom have then? Add; 88¢

4. At the picnic there were 125 children. Of this number 61 were girls. How many boys were at the picnic? Subtract; 64

5. On a ride to Blue Lake, Jack and Alice counted cars. Jack counted 85 cars going to the lake. Alice counted 34 cars going away from the lake. How many cars did both children count? Add; 119

6. Susan painted 65 Christmas cards last week. She still has 70 more cards to paint. How many Christmas cards will Susan paint all together? Add; 135

7. Susan will use 40 Christmas cards and sell the rest. How many cards will Susan sell? Subtract; 95

8. Susan has 30 stamps to put on the cards she will use. How many more stamps does Susan need for her 40 cards? Subtract; 10

Urge pupils to read problems carefully (see page 91). Have them explain why they added or subtracted; what key expressions helped them.

Introduce subtraction with 3-place subtrahends without changing.
Review and extend knowledge of place value.

Subtracting Three-Place Numbers

1. **Problem** Tom has 655 stamps all together. He has 423 stamps of this country. The rest of his stamps are from other countries. How many stamps has Tom from other countries? 232

Explanation You can write the numbers in this way:

6 hundreds 5 tens 5 ones
4 hundreds 2 tens 3 ones
2 hundreds 3 tens 2 ones

How many stamps are from other countries? 232

Here is a short way to subtract: Think, "3 ones from 5 ones, 2 ones." Write 2 in ones place. Think, "2 tens from 5 tens, 3 tens." Write 3 in tens place. Think, "4 hundreds from 6 hundreds, 2 hundreds." Write 2 in hundreds place. The answer is 232. So 232 stamps came from other countries.

Hundreds	Tens	Ones
6	5	5
4	2	3
2	3	2

Subtract. Check your answers by adding up: Stress.

2.	753	964	868	786	782	596
	341	841	316	653	421	365
	412	123	552	133	361	231
3.	447	974	265	836	557	798
	321	212	142	402	424	247
	126	762	123	434	133	551
4.	539	298	964	936	549	874
	324	134	350	621	142	633
	215	164	614	315	407	241

More Practice. See ⑮ on page 317. Use for individual pupil assistance.

To the Teacher. See page 328 for the additive method of subtraction.
Explain ex. 1 as shown above in terms of hundreds, tens, and ones. Then proceed to abstract form shown in red. Have some examples done in both forms. Stress that ones are subtracted from ones, tens from tens, and hundreds from hundreds.

Introduce these subtraction situations: (a) no remainder in tens or hundreds place and (b) one- and two-place subtrahends.

Subtracting Numbers

1. **Problem** There are 48 children in our room at school. 45 of them went to the picnic. How many children did not go to the picnic? 3

Explanation In this example you get 0 when you subtract 4 tens from 4 tens. You do not need to write 0 in the answer because there are no more numbers at the left to subtract. Only 3 children did not go to the picnic.

$$\begin{array}{r}48\\-45\\\hline 3\end{array}$$

2. Here are other subtraction examples to study. You should watch the places where you do not write zero:

85	96	273	137	384	297
82	4	51	3	371	292
3	92	222	134	13	5

3. Cover the answers in ex. 2 with a paper. Then try to write the answers on the paper.

Subtract these numbers mentally:

4. 56 − 51 5 89 − 80 9 37 − 33 4 96 − 94 2

5. 75 − 70 5 47 − 42 5 68 − 65 3 24 − 20 4

Subtract these numbers. Check by adding up:

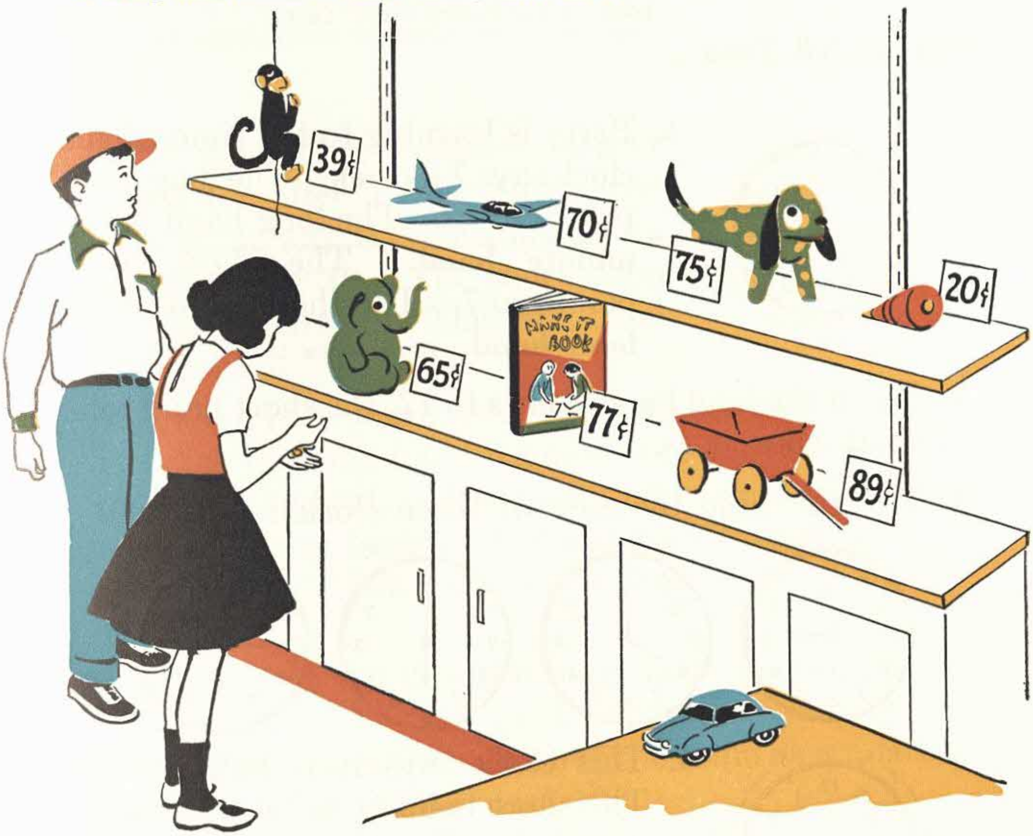
6.	28	88	273	198	309	473
	6	84	42	7	301	50
	22	4	231	191	8	423
7.	39	67	619	299	168	717
	32	60	614	63	161	16
	7	7	5	236	7	701

More Practice. See ⑯ on page 318. Have pupils do these orally, stressing place value of the figures.

To the Teacher. See page 328 for the additive method of subtraction.

Point out that we do not write subtraction answers such as 05, 09, and 006, since the zeros are not needed. The absence of figures to the left of a number has the same meaning as if zeros were written in these positions.

Develop awareness of what money will buy.



Has Each Child Enough Money?

Review values of bills and coins.

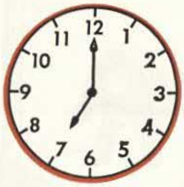
Answer "Yes" or "No":

1. Bill has a half dollar. Can he buy the wagon? No
2. Peter has a quarter. Can he buy the top? Yes
3. Susan has 8 dimes. Can she buy the dog? Yes
4. Ann has a dollar. Can she buy the book? Yes
5. Mary has 4 dimes. Can she buy the monkey? Yes
6. Jack has 9 dimes. Can he buy the airplane? Yes
7. Dick has 5 dimes and a quarter. Can he buy the elephant? Yes

In ex. 1-7 have pupils explain why the money is or is not sufficient to buy the item. Make up more problems involving money and items shown. Have pupils discuss these in similar way.

Redevelop telling time to the hour and half hour on this page. Demonstrate with large clock or cardboard clock face.

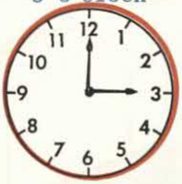
How to Tell Time

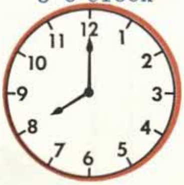


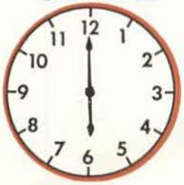
1. Betty is learning to tell time. This clock says 7 **o'clock.** The long hand points to 12. The long hand is the **minute hand.** The short hand points to 7. The short hand is the **hour hand.** Stress new terms.

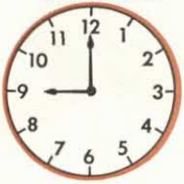
2. When the long hand points to 12, the short hand tells what hour it is.

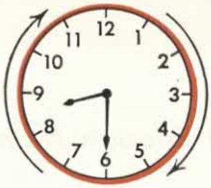
3. Tell the time by each of these clocks:


3 o'clock


8 o'clock

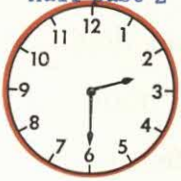

6 o'clock

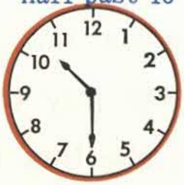

9 o'clock

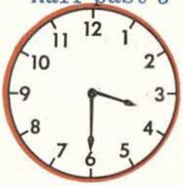


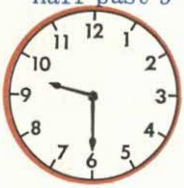
4. This clock says it is **half past** 8. The short hand is halfway between 8 and 9. The long hand is at 6. When it is half past 8, you see that the long hand has gone halfway around the clock. The arrows show the way the hands go around the clock.

5. Tell the time by each of these clocks:


Half past 2


Half past 10


Half past 3


Half past 9

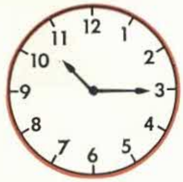
6. Tell where the long hand and the short hand of the clock point at half past 1; at half past 7; at half past 4; at half past 12. See Guide for answers.

Pupils should observe that both hands move in the same direction but at different speeds. Have pupils demonstrate on clock face where the hands will be at times specified by you. Challenge rapid learners to compare the speeds at which the hands move.

Extend telling time to the quarter hour and 5-minute intervals. Have pupils make clock faces of their own from paper plates.

How to Tell Time

1. Betty goes for her music lesson at a **quarter after** 10 on Saturdays. This is the way the clock looks at a quarter after 10. The short hand is a little past 10. The long hand points to 3.

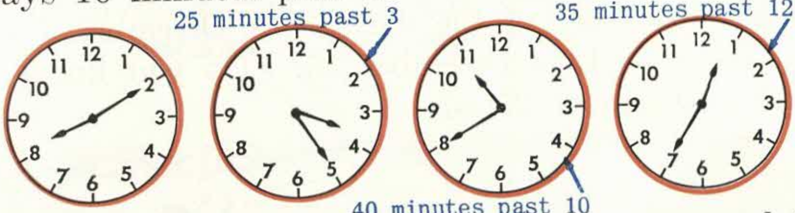


2. You see a little mark near each number on the clock. It takes the long hand 5 minutes to move from one mark to the next. How many minutes does it take the long hand to move from 12 to 1? 5 from 1 to 2? 5 from 2 to 3? 5 from 12 to 3? 15 from 12 to 4? 20 from 12 to 9? 45

3. You see that it takes the long hand 15 minutes to go from 12 to 3. The clock above says 15 minutes past 10. 15 minutes past 10 is the same as a quarter after 10 or a quarter past 10.

4. Beginning at 1, point to each number around the clock and count the minutes by 5's. How many minutes make a half hour? 30 an hour? 60 How many minutes after the hour is it when the long hand points to 5? 25 to 8? 40 to 11? 55

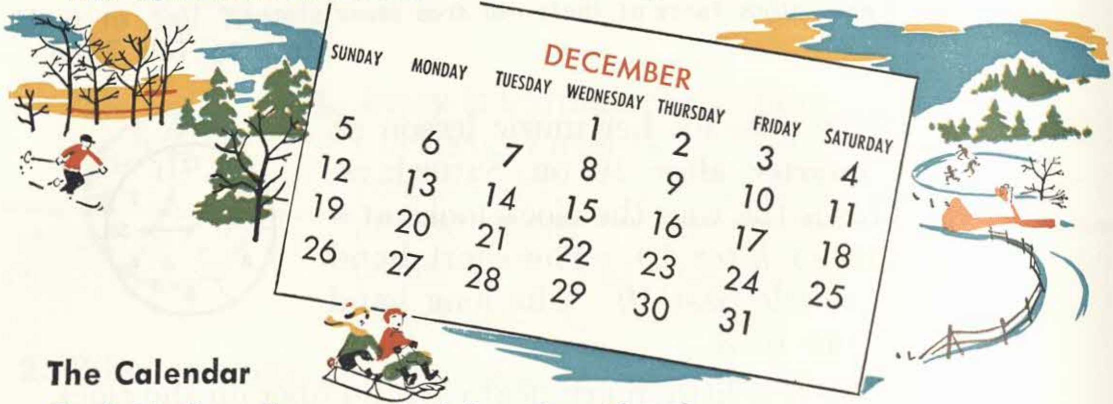
5. Tell the time by each of these clocks. The first clock says 10 minutes past 8.


25 minutes past 3
35 minutes past 12
40 minutes past 10

The time on the third clock is sometimes read "20 minutes to 11." How is the time on the last clock sometimes read?

Have pupils show the positions of the hands on their clock faces as they do ex. 1-4. Summarize discoveries on a large clock face. Have pupils make a schedule of daily activities, drawing clock faces to illustrate the times.

Give experiences in reading and understanding calendar.



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

The Calendar

See Guide for reference material on days of week.

1. This is a calendar for the month of December. Read all the numbers on it. How many days are there in the month of December? 31

2. The days of the week are Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. How many days are there in a week? 7

3. What is the name of the first day of the week? Sunday the second day? Monday the last day? Saturday

4. What is the first day of the school week? Monday the last day of the school week? Friday

5. What is the name of today? of yesterday?

6. Look at the calendar above. On what day of the week does the month of December begin on this calendar? Wednesday On what day does it end? Friday

7. On what day of the week does December 7 come? Tuesday December 15? Wednesday December 25? Saturday Do you know what day December 25 is? Christmas

Extend calendar understanding to months of year. Have pupils make monthly calendar. Use to record weather, note events to come or passed, and so on.

Months of the Year

See Guide for suggestions and discussion of months.

These are the names of the months of the year. Read the names from 1 to 12:

1. January
2. February
3. March
4. April
5. May
6. June
7. July
8. August
9. September
10. October
11. November
12. December

1. What is the name of the first month of the year? January the second month? February the sixth month? June the last month? December

2. In what month of the year is your birthday? In what month of the year is Christmas? December

3. The four parts of the year are spring, summer, fall, and winter. The month of May comes in the spring. In which part of the year does January come? Winter In which part of the year does July 4 come? Summer In which part of the year does Thanksgiving come? Fall

4. On pages 108 and 109, which picture shows spring? (1) Which shows summer? (2) fall? (3) winter? (4) (1) Bottom, page 108; (2) top, page 109; (3) bottom, page 109; (4) top, page 108.

Develop readiness for column addition by teaching adding by endings without bridging ten.

Adding by Endings

1. Jack spent 5¢ for a crayon and 3¢ for a pencil. How much did he spend in all? 8¢

2. Susan spent 15¢ for paper and 3¢ for a pencil. How much did Susan spend? 18¢

▸ When you add 15 and 3 you are adding a one-place number to a two-place number. This is called **adding by endings.** You can do the work mentally. If 3 is added to a number ending in 5, the answer ends in ..8.. How much is 45 + 3? 48

Stress.

3. How much is 25¢ + 3¢? 28¢ How much is 85¢ + 3¢? 88¢

Study the pairs of examples below. Then tell the sums:

4.	4	14	2	42	3	63	6	26
	5	5	7	7	4	4	2	2
	9	19	9	49	7	67	8	28

Give the sums. They will help you do column addition: See Guide.

5. 13 + 3 = 16 53 + 3 = 56 23 + 3 = 26 73 + 3 = 76

6. 16 + 1 = 17 86 + 1 = 87 46 + 1 = 47 36 + 1 = 37

7. 15 + 4 = 19 35 + 4 = 39 65 + 4 = 69 95 + 4 = 99

8. 22 + 4 = 26 92 + 4 = 96 52 + 4 = 56 42 + 4 = 46

9. 34 + 3 = 37 64 + 3 = 67 14 + 3 = 17 54 + 3 = 57

10.	51	24	70	46	35	82	53	97
	7	5	8	3	2	5	6	2
	58	29	78	49	37	87	59	99
11.	85	54	36	72	16	21	92	83
	4	5	2	7	3	7	5	3
	89	59	38	79	19	28	97	86
12.	17	60	25	43	62	45	56	23
	2	8	2	4	4	3	1	6
	19	68	27	47	66	48	57	29

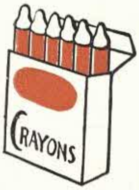
Using a place-pocket chart, demonstrate the meaning of the addition. First show basic fact, e.g. 5 + 3, then 15 + 3, 25 + 3, etc. Lead pupils to see that basic fact provides the ending for each sum.

Since the purpose of adding by endings is to facilitate column addition, continue to stress mental addition on this page.

Adding by Endings

Give the answers to these:

1. 12 and 7 19 55 and 3 58 21 + 5 26 56 + 3 59
2. 24 and 5 29 13 and 6 19 63 + 6 69 25 + 4 29
3. 41 and 8 49 15 and 2 17 14 + 4 18 92 + 2 94
4. 63 and 2 65 17 and 1 18 50 + 8 58 71 + 4 75
5. 50 and 9 59 66 and 3 69 71 + 7 78 24 + 5 29
6. 83 and 4 87 16 and 2 18 22 + 5 27 33 + 6 39
7. Peter had 14 marbles and Jack gave him 5 more. How many marbles has Peter now? 19
8. Alice spent 15¢ for stamps and 3¢ for a pencil. How much did Alice spend in all? 18¢



9. Bill bought crayons for 12¢ and a pencil for 3¢. How much did he spend in all? 15¢
10. Tom spent 13¢ and Dick spent 4¢. How much did both boys spend? 17¢
11. Mary has 10 books and Peggy has 6 books. How many books have the girls all together? 16

Add 1 to each of these numbers:

12. 45 46 85 86 35 36 95 96 23 24 53 54 83 84 63 64
13. 41 42 81 82 21 22 51 52 16 17 76 77 26 27 46 47
14. 34 35 94 95 54 55 84 85 32 33 72 73 52 53 12 13
15. 65 66 43 44 86 87 24 25 82 83 90 91 71 72 22 23
16. Add 2 to each number in ex. 12–15. Add 3 to each number in ex. 12–15. Consult Guide for answers.

Urge pupils to give the answers quickly, since adding must be done mentally in column addition. After pupils give the answers, ask them to identify the key addition fact used.

Provide opportunities to use new skill in column addition in problems and examples.

Column Addition

1. **Problem** Find the sum of 3¢, 9¢, and 5¢. 17¢

Explanation Write the numbers in a column and add up. Think, "5 + 9 = 14." Then add 14 and 3. The sum is 17¢. Check by adding down. Think, "3 + 9 = 12. 12 + 5 = 17."

3
9
5
17

2. Ann had 9¢. She found 2¢ and her father gave her 5¢. How many cents in all did Ann have then? 16¢

3. Bill found 7 eggs in the hen house, 5 eggs in the barn, and 3 eggs in the grass. How many eggs did Bill find all together? 15

Have pupils do work orally as check of mastery of skill.

Add. Begin at the bottom of each column and add up. Check your work by adding down: New facts used in checking.

4.	2	5	4	9	7	2	4	6	4
	8	7	8	5	2	9	7	6	6
	7	7	4	5	9	3	5	4	9
	17	19	16	19	18	14	16	16	19
5.	8	5	8	9	1	2	8	7	6
	6	6	3	2	9	6	7	9	4
	5	8	8	8	4	9	4	3	7
	19	19	19	19	14	17	19	19	17
6.	5	7	2	2	4	6	5	3	2
	8	6	8	9	8	5	6	7	6
	4	6	9	5	6	6	7	6	7
	17	19	19	16	18	17	18	16	15

More Practice. See ⑰ on page 318. Use for reinforcement.

Provide experiences with one-step problems involving some skills and concepts taught.

Fun in Winter

Do you ever have snow where you live? Can you skate on the ice? These problems tell about things the children do where there is snow and ice.

1. Jack cleans the snow off sidewalks in winter. Today Mr. Strong paid him 50¢. Miss White paid him 45¢. How much money did Jack earn all together? 95¢
2. Mary went skating yesterday. She stayed on the ice from 4 o'clock until half past 5. How long did Mary stay on the ice? 1 hour and 30 minutes, or $1\frac{1}{2}$ hours Look at a clock to find the answer.
3. The boys and girls had fun throwing snowballs. Bill made 5 snowballs, Bob made 3, and Joe made 6. How many snowballs did the boys make? 14
4. Susan made 4 snowballs, Betty made 5, and Sally made 3. How many snowballs did the girls make? 12
5. How many are 7 snowballs and 8 snowballs? 15
6. Ann wants to buy a skating cap that costs 98¢. She has 75¢. How much more money does Ann need? 23¢
7. After school there were 15 children on the skating pond. Only 9 children were skating. The rest were making snow men. How many children were making snow men? 6

Motivate interest through discussion of experiences, or through pictures and stories about snow countries. Have pupils tell how they found answers.

This page reviews some of the previously taught concepts and skills that may need further emphasis.

Oral Practice

Tell the answers:

1. 10 + 6 = 16 32 + 6 = 38 28 + 1 = 29 16 − 8 = 8

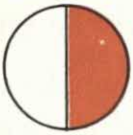
2. 15 − 9 = 6 45 + 3 = 48 13 + 4 = 17 14 + 4 = 18

3. 24 + 3 = 27 14 − 8 = 6 51 + 7 = 58 12 − 5 = 7

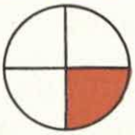
4. 17 − 8 = 9 20 + 9 = 29 11 − 8 = 3 46 + 3 = 49

5. Tell what part of each picture is red:

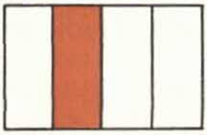
One half



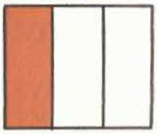
One fourth



One fourth



One third



6. How many dimes are there in a dollar? 10

7. How many nickels make a dime? 2 a half dollar? 10

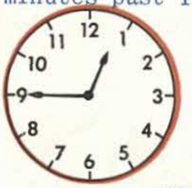
8. How many quarters make a dollar? 4

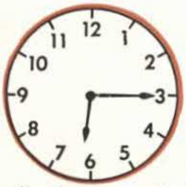
9. Tell what number means 5 hundreds 0 tens 7 ones; 507
9 hundreds 6 tens 0 ones. 960

10. Read these numbers: 258, 700, 1958, 1700.

11. Tell the time by each clock:

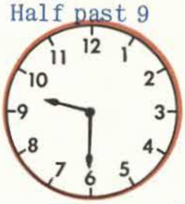
45 minutes past 12

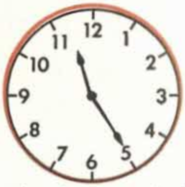




15 minutes past 6

Half past 9





25 minutes past 11

Tell the answers:

12.	3	7	2	1	4	3	4	2	2
	4	0	1	2	2	6	3	6	5
	1	2	3	5	4	0	2	1	3
	8	9	6	8	10	9	9	9	10

Note individual or class weaknesses; plan reteaching accordingly. Work with those needing help individually or in small groups. Short practice periods each day will help to reinforce skills.

This page may be used either as a review or as a test. It would be a good plan to review arithmetic words used in this chapter.

Column Addition

Add these numbers and check your work:

1.	4	8	6	7	3	2	2	1	3
	1	3	9	0	3	9	2	2	4
	9	6	1	9	8	6	7	8	4
	14	17	16	16	14	17	11	11	11
2.	9	8	5	6	1	9	5	6	2
	2	2	3	5	9	6	5	6	7
	1	6	3	3	8	4	4	1	6
	12	16	11	14	18	19	14	13	15
3.	8	6	8	6	8	2	5	8	3
	1	2	4	1	7	7	8	0	8
	5	5	4	8	1	3	2	6	7
	14	13	16	15	16	12	15	14	18
4.	7	4	5	7	3	9	2	8	2
	3	3	2	2	6	8	8	9	8
	5	5	9	4	6	2	3	2	8
	15	12	16	13	15	19	13	19	18

More Practice. See ⑱ on page 318.
Assign "More Practice" as needed to speed up responses.

Do You Know the Right Word?

Read each exercise below and then tell the word that goes in each space:

5. One of the two equal parts of a pie is called . . . half.
6. The number 38 means 3 . . . tens, 8 . . . ones.
7. The number 83 means 8 . . . tens, 3 . . . ones.
8. Another name for a penny is a . . . cent.
9. When you take 7 from 10 you are . . . subtracting.
10. When you say that 4 and 6 make 10 you are . . . adding.
11. When you add, the answer is called the . . . sum.

Extend the review of arithmetic words in ex. 5-11 by using other words and expressions taken from the class arithmetic chart as appropriate.

Review the meaning of words used in describing addition, such as "both," "all," "in all," "all together," and "sum."

The Meaning of Addition

1. Yesterday Ann sold 12 tickets. Today she sold 15. How many tickets did Ann sell **both** days? 27

2. Bill spent 5¢ for candy, 7¢ for ice cream, and 7¢ for peanuts. How much did **all** these things cost? 19¢

3. Mother picked 6 red roses, 8 yellow roses, and 4 white roses. How many roses did she pick **in all?** 18

4. Tom earned 40¢. His mother gave him 25¢. How much did Tom have then? 65¢

5. The two school busses carried 33 children and 35 children. How many children did the busses carry **all together?** 68

6. Mother baked cupcakes in 3 pans. She had 6 cakes in one pan, 6 in another, and 4 in another. How many cupcakes did Mother bake? 16

Words denoting addition may be included on class chart.

In the **addition** problems above, you put two or more groups together to make one large group, called the **sum.** The sum is larger than any one of the groups added.

Words like **both, all, in all,** and **all together** help you to know that you must add to find the answer. Do subtraction problems use these words?

Emphasize this.

In an addition problem you put numbers together to find their sum. The sum is larger than any of the numbers added unless just zero is added.

Have pupils illustrate with materials how groups are combined. Have them make up problems, illustrate them, and describe the thought patterns that are involved. Stress that when zero is added to a number, the sum is that number.

Prepare for chapter test through written review of skills and concepts taught.

Mixed Practice

Add these numbers. Check your work: Stress.

1.	1	4	3	2	9	4	2	4	2
	2	0	9	5	2	8	1	0	6
	9	9	5	9	6	3	7	6	6
	12	13	17	16	17	15	10	10	14

2.	53	70	26	16	303	124	153
	42	42	33	60	281	574	316
	95	112	59	76	584	698	469
3.	84	44	77	20	472	351	332
	63	21	91	45	525	338	542
	147	65	168	65	997	689	874

4. Add 4 to each of these numbers:

12 16 33 37 61 65 90 94 45 49 14 18 20 24 73 77

5. Add 2 to each number in ex. 4.(1) Add 3 to each.(2) (1) 14,3
63, 92, 47, 16, 22, 75; (2) 15, 36, 64, 93, 48, 17, 23, 76

6. Write the numbers by 10's from 260 to 300. 260, 270, 280, 290, 300

7. Write the numbers by 100's from 300 to 1000. 300, 400, 500, 600, 700, 800, 900, 1000

Subtract these numbers. Check your work: Stress.

8.	86	97	67	79	692	983	657
	23	21	65	33	292	582	156
	63	76	2	46	400	401	501
9.	39	94	88	56	157	581	139
	6	82	63	25	66	500	44
	33	12	25	31	91	81	95

10. Subtract 345 from 778. 433 Take 340 from 569. 229

11. From 137 take 92. 45 From 498 subtract 374. 124

Write these numbers in figures:

12. six hundred ten 610 fifteen hundred 1500

13. nine hundred fifty 950 two hundred ninety-one 291

Observe pupils as they work. Note hesitancy and errors, and regroup pupils for reteaching. Use "More Practice" pages, adding-by-endings cards, place-value pocket chart, and so on, for reteaching or drill.

Consult the Teacher's Guide for an explanation of how the items in this review are correlated with the aims of the chapter.

Chapter Review

1. Write **four hundred thirty-six** in figures. 436
2. Write **twelve hundred eighty-five** in figures. 1285
3. Write in figures: **one half;** $\frac{1}{2}$ **one fourth.** $\frac{1}{4}$
4. Write the number of cents in 8 nickels. 40¢
5. Write the number of cents in 6 dimes. 60¢
6. Count by 1's from 89 to 109; from 218 to 229. See Guide.
7. Count by 10's from 70 to 110;(1) from 650 to 690.(2) (1) 70, 80, 90, 100, 110; (2) 650, 660, 670, 680, 690
8. Count by 5's from 125 to 160;(1) from 300 to 330.(2) (1) 125, 130, 135, 140, 145, 150, 155, 160; (2) 300, 305, 310, 315, 320, 325, 330
9. Count by 100's from 1400 to 1900. 1400, 1500, 1600, 1700, 1800, 1900
10. Add 5 to each number: 13,^{18} 82,^{87} 41,^{46} 80,^{85} 34,^{39} 62.^{67}
11. Add 10 to each number: 15,^{25} 37,^{47} 29,^{39} 86,^{96} 52,^{62} 78.^{88}

Find these sums and check your work:

12.	5	2	7	7	5	5	4	7	3
	7	8	3	4	3	5	8	6	8
	6	5	9	8	9	9	2	5	4
	13	15	19	19	17	19	14	18	15
13.	3	8	9	5	3	3	4	7	6
	9	5	2	9	8	8	6	9	4
	2	6	8	3	3	8	7	2	9
	14	19	19	17	14	19	17	18	19

14.	57	64	53	80	146	283	326
	32	15	24	90	23	413	250
	89	79	77	170	169	696	576

Subtract these numbers and check your work:

15.	89	67	96	75	174	347	984
	81	22	66	34	80	125	754
	8	45	30	41	94	222	230

Use review to prepare for diagnostic test. Note errors on progress cards. See suggestions for reteaching on page 117. Let pupils who have mastered skills work at arithmetic corner.

This is the third Problem Test. Try to have all your problems right. Each problem counts 10.

1. Bob caught 12 fish and Dick caught 7 fish. How many more fish did Bob catch than Dick? 5
2. Susan picked up 7 yellow leaves, 6 brown leaves, and 5 red leaves. How many leaves did she pick up? 18
3. There are 35 children in Miss Wood's room. 20 of them are girls. How many boys are there? 15
4. After school today Ann earned 50¢. Last Saturday she earned 75¢. How much less did Ann earn today than she earned last Saturday? 25¢
5. Bill paid 50¢ for a new game and 40¢ for a book. How much did he pay for both things? 90¢
6. Mary wants to sell 250 Christmas cards. She has sold 110 cards so far. How many more cards does Mary need to sell? 140
7. Jack had 50¢. He spent 30¢ to go to the movies. How much money did he have left? 20¢
8. Betty had 90 pretty buttons in a box. Today Aunt Jane gave her 45 more buttons. How many buttons all together has Betty now? 135
9. This afternoon 8 girls, 9 boys, and 2 teachers will go to Grand Park for a picnic. How many people will go to the picnic? 19
10. Joe bought 275 stamps to put in his book. Now he has put 150 of them in the book. How many stamps does he still have to put in the book? 125

Group together those pupils who have the most trouble in problem solving. Have them read the problems orally, tell their meaning, and show how to find the answers. Determine sources of difficulty and plan reteaching accordingly.

Assign this diagnostic test of skills taught to date.
Stress the need for independent work on the test.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Page for that row and do the work on that page.

Add these numbers and check your work:

							Practice Pages
1.	76 13 89	15 42 57	63 22 85	76 91 167	37 80 117	53 84 137	95
2.	35 4 39	24 3 27	41 8 49	67 2 69	90 7 97	52 6 58	110
3.	542 347 889	221 355 576	303 643 946	124 745 869	324 522 846		96
4.	7 1 3 11	9 0 5 14	8 1 6 15	4 5 3 12	6 2 4 12	2 7 2 11	97
5.	8 4 7 19	5 7 5 17	4 4 9 17	3 8 6 17	7 2 8 17	6 7 4 17	112 115

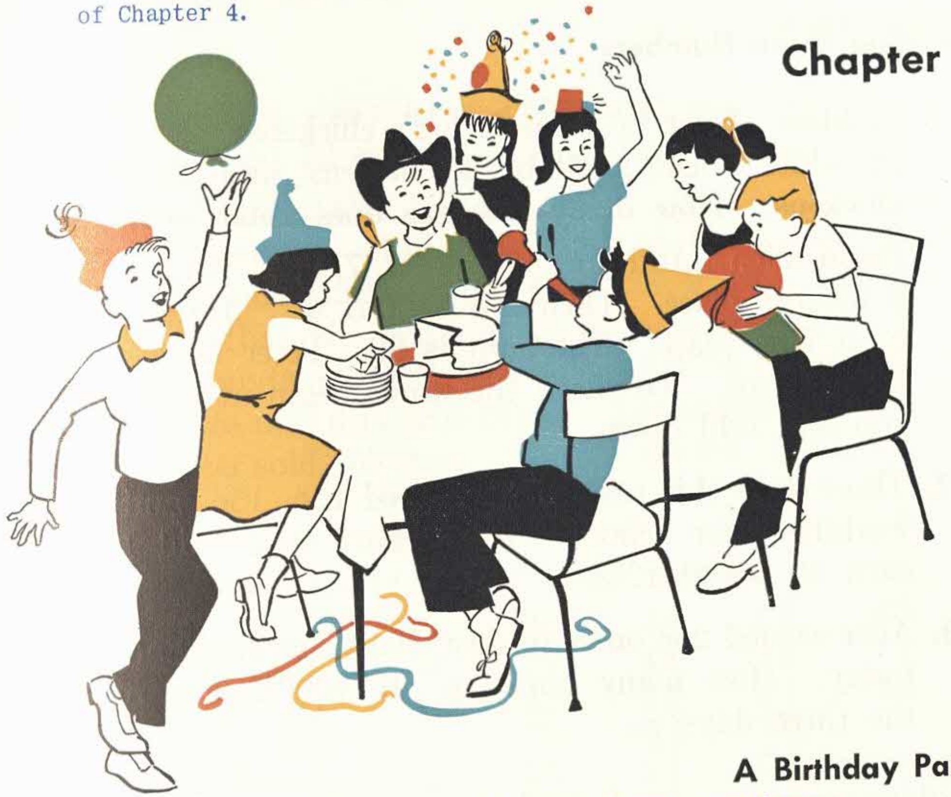
Subtract these numbers and check your work:

6.	79 36 43	58 22 36	96 43 53	45 14 31	89 42 47	67 52 15	37
7.	139 62 77	166 70 96	148 53 95	187 91 96	159 75 84		101
8.	734 513 221	528 316 212	985 350 635	674 262 412	349 207 142		103
9.	648 641 7	367 14 353	586 184 402	357 352 5	978 907 71		104

Record weaknesses in basic skills on pupils' progress cards; compare with previous weaknesses. Urge pupils to work independently on assignments that they know they need for review.

Consult the Teacher's Guide for a discussion of the specific aims of Chapter 4.

Chapter 4



A Birthday Party

Present problem-solving situation in natural experience.

1. On Ann's birthday the children had a party. There were 12 boys and 13 girls at the party. How many children in all were at the party? 25

2. There were funny paper hats for the children. There were 15 clown hats and 14 cowboy hats. Were there enough hats for each girl and each boy to have one? Yes

3. A large birthday cake was cut into 32 pieces. Another cake was cut into 16 pieces. How many pieces of cake were there all together? 48

4. The children played games. Ten children played games on the grass. The other children played games in the house. How many of the 25 children played games in the house? 15

Arouse interest through discussion of a recent or an anticipated birthday party. Let pupils make up own problems about their parties. Have different pupils write problem in numbers on board, and let class solve it.

Introduce the addition of three 2-place numbers without carrying.

Adding Three Numbers

1. **Problem** Peter feeds his father's chickens. There are 32 white chickens, 24 black chickens, and 33 brown chickens. How many chickens does Peter feed? 89

Explanation Add up. Think "3, 7, 9." Write 9 in ones place. Then think "3, 5, 8." Write 8 in tens place. The sum is 89. Peter feeds 89 chickens. To check the work, begin at the top and add down.

$$\begin{array}{r} 32 \\ 24 \\ \underline{33} \\ 89 \end{array}$$

2. Three days this week Peter earned 10¢, 15¢, and 40¢ working after school. How many cents did Peter earn all together? 65¢

3. Alice earned 25¢ on Saturday, 30¢ yesterday, and 20¢ today. How many cents in all did Alice earn in the three days? 75¢

Add these numbers and check your work: Stress checking.

4.	13	51	12	20	25	30	41	36
	30	26	34	36	40	13	32	32
	43	21	23	42	13	44	14	30
	86	98	69	98	78	87	87	98
5.	41	14	43	32	21	44	30	21
	12	22	22	10	11	21	53	47
	22	53	14	47	52	33	12	21
	75	89	79	89	84	98	95	89
6.	34	57	17	46	31	26	12	25
	24	20	51	30	24	21	34	21
	31	22	21	13	12	51	50	22
	89	99	89	89	67	98	96	68
7.	55	41	56	20	24	65	11	10
	13	30	12	43	40	13	55	16
	10	25	31	14	24	21	21	42
	78	96	99	77	88	99	87	68

Have pupils do this work orally. Check to see if basic facts are causing difficulty. Stress adding up and checking down. Urge pupils to add quickly.

The sum of the figures in the tens column is 10 or more on this page.
Emphasize the place value of the figures in the sums.

Column Addition

1. **Problem** Last week Peter sold eggs for his father. He sold 72 eggs, 12 eggs, and 84 eggs. How many eggs did Peter sell last week? 168

Explanation Add up. Think "4, 6, 8." Write 8 in ones place. Then think "8, 9, 16." You see that the sum of the tens is 16 tens, or 1 hundred and 6 tens. Write 1 in hundreds place and 6 in tens place. The answer is 168. Peter sold 168 eggs. Check the work by adding down.

```
 72
 12
 84
---
168
```

Add. Begin at the bottom of each column and add up. Check the work by adding down: Stress.

2.	42 12 65 119	54 43 21 118	53 34 21 108	40 22 45 107	44 44 30 118	68 10 61 139	73 13 62 148	57 10 81 148
3.	74 31 32 137	46 22 61 129	73 52 42 167	25 72 22 119	21 86 91 198	30 62 27 119	64 72 23 159	52 15 72 139
4.	33 40 44 117	15 43 50 108	62 24 52 138	65 10 73 148	53 31 55 139	60 16 41 117	91 52 12 155	73 21 52 146
5.	54 30 45 129	75 20 32 127	74 23 62 159	27 10 72 109	92 64 32 188	40 33 74 147	81 10 18 109	83 41 12 136

6. For a school party the children brought 72 sugar cookies, 60 nut cookies, and 36 orange cookies. How many cookies did they bring? 168

7. At a picnic there were 42 boys, 36 girls, and 10 mothers. How many people were at the picnic? 88

Review place value with pupils. Let them show (use pocket chart or abacus) that 16 tens is 1 hundred and 6 tens. Discuss sums in ex. 2 in same way. Check skill of adding by endings by having pupils explain sums orally.

Introduce adding by endings where bridging of ten is required. Consult the Teacher's Guide for an explanation of the process.

Adding by Endings

1. Betty paid 6¢ for lollipops and 8¢ for stick candy. How much did she pay all together? 14¢

2. Tom paid 16¢ for paint and 8¢ for paper. How much did Tom spend in all? 24¢ Here is one way to find the sum: 16¢ + 8¢ = 16¢ + 4¢ + 4¢ = 20¢ + 4¢ = 24¢.

3. In ex. 2 you added a two-place number and a one-place number. There is a short way to get the answer. Study the sums below:

6	16	26	76	46	86	56	36
8	8	8	8	8	8	8	8
14	24	34	84	54	94	64	44

Inquire why the tens figure is 1 more in each sum.

All the sums above end in 4 because the sum of 6 and 8, which is 14, ends in 4. The tens figure of each sum is 1 more than the tens figure of the two-place number because 6 + 8 is 1 ten and 4.

4. **Problem** How many are 59 and 8? 67 Find the sum of these two numbers the short way.

Explanation Think, "The sum ends in 7 because the sum of 9 and 8 ends in 7. The tens figure of the sum is 1 more than 5, which is 6, because 9 + 8 is 1 ten and 7. 67 is the sum."

$$\begin{array}{r} 59 \\ +8 \\ \hline 67 \end{array}$$

Demonstrate with objective materials.

Add these mentally. Tell only the answers: Stress mental addition.

5.	9	29	59	69	6	36	76	46
	4	4	4	4	6	6	6	6
	13	33	63	73	12	42	82	52
6.	7	47	17	67	5	35	85	25
	8	8	8	8	6	6	6	6
	15	55	25	75	11	41	91	31

Illustrate the relationship among examples in ex. 3 by using a hundred chart. Have pupils explain why all sums are found in the same column of chart. Stress importance of key addition fact.

Provide further mental practice in adding by endings where bridging of ten is involved; practice cards may be utilized.

More Practice

Add these numbers mentally. Give only answers:

1.	34 6 40	54 6 60	67 4 71	77 4 81	22 9 31	82 9 91	18 7 25	48 7 55
2.	37 9 46	67 9 76	25 8 33	45 8 53	46 5 51	86 5 91	79 3 82	59 3 62
3.	8 18 26	8 48 56	4 29 33	4 59 63	9 64 73	9 84 93	7 25 32	7 35 42
4.	3 49 52	3 69 72	6 54 60	6 74 80	5 17 22	5 57 62	2 68 70	2 78 80

Find the sums:

5.	27 + 6 33	37 + 6 43	6 + 57 63	6 + 87 93
6.	14 + 8 22	24 + 8 32	8 + 44 52	8 + 74 82
7.	35 + 7 42	85 + 7 92	7 + 25 32	7 + 45 52

Add 4 to each number below. Then do the examples again, adding 5 to each number. Do them again, adding 8, 6, 7, 9, 3, in turn, to each number. Do the work mentally: See Guide.

8.	31	81	21	51	14	34	64	74
9.	80	60	50	20	75	15	35	65
10.	72	12	52	32	18	48	28	78
11.	56	26	86	46	49	29	19	89
12.	17	47	67	57	83	63	43	13
13.	38	88	58	68	16	76	36	66
14.	44	73	27	39	45	62	40	71

Since the conventional regrouping involved in carrying in addition is inappropriate in the mental addition on this page, emphasize the key addition fact. You may also have pupils "think" sums in this way: 67 + 9 = 67 + (3 + 6) = (67 + 3) + 6 = 70 + 6 = 76.

Teach column addition where adding by endings involves bridging the tens.

What Are Their Scores?

1. Bill is playing a game. He has 4 rings to throw. He throws one over 6, another over 4, a third over 6, and the last one over 5. To find his score, Bill writes the numbers as shown at the right. Then he adds up, thinking "5, 11, 15, 21." He checks his answer by adding down. He thinks "6, 10, 16, 21." Bill gets 21 each time he adds. His score is 21.

$$\begin{array}{r} 6 \\ 4 \\ 6 \\ 5 \\ \hline 21 \end{array}$$

2. Susan throws one ring over 5, another over 7, a third over 6, and the last one over 5. Find her score. 23

Do not let pupils say 8 and 5 are 13, and so on, in following examples.

Find the scores the other children made:

3.	5	0	4	9	5	6	7
	4	4	0	4	6	7	9
	5	9	0	0	8	4	0
	8	8	9	9	4	5	4
	22	21	13	22	23	22	20

4.	9	6	5	8	4	7	0	9	6
	2	3	9	0	4	2	6	1	4
	7	6	6	7	3	0	9	2	8
	4	8	2	5	9	9	9	9	5
	22	23	22	20	20	18	24	21	23

5.	6	7	9	3	8
	5	3	4	7	4
	6	0	0	3	5
	8	8	8	8	7
	25	18	21	21	24
6.	8	7	5	2	4
	4	5	5	9	0
	0	4	8	4	9
	5	4	4	8	5
	17	20	22	23	18

More Practice. See ⑲ on page 319.

Urge pupils to work rapidly by omitting unnecessary words. Let pupils use "More Practice" as test of own speed and accuracy.

Review subtraction of 3-figure numbers without changing.

Problems and Practice

1. How much less than $250 is $140? $110
2. How much more must be put with $342 to make $588? $246
3. How many more than 144 flowers are 165 flowers? 21

Subtract these numbers and check your work:

4.	69	93	178	148	107	156
	17	80	91	67	31	66
	52	13	87	81	76	90
5.	84	97	116	155	162	128
	63	42	74	83	70	54
	21	55	42	72	92	74
6.	76	35	138	179	149	186
	30	24	82	85	59	95
	46	11	56	94	90	91

7. Take fifty-two from eighty-eight. 36
8. Subtract sixty-five from ninety-six. 31
9. How much less than thirty-nine is fifteen? 24
10. How much more than seventeen is fifty-eight? 41

Subtract these numbers and check your work: Stress checking.

11.	55	76	389	447	446	789
	25	63	156	307	142	530
	30	13	233	140	304	259
12.	98	47	578	596	919	542
	77	20	456	182	105	212
	21	27	122	414	814	330
13.	88	79	864	789	687	291
	28	32	142	404	556	121
	60	47	722	385	131	170
14.	90	99	835	576	697	785
	10	63	431	343	131	230
	80	36	404	233	566	555

Urge all pupils to do ex. 4-6 mentally and include ex. 11-14 for brighter pupils. Let slower pupils talk out examples, stressing subtraction of ones from ones, and so on.

Emphasize the variety of language patterns that denote the take away concept of subtraction.

How Many Are Left?

1. To **take away** a number of things from a larger number of the same things, you **subtract.** When you subtract, you find how many things are left.
2. There are many words that tell you that something must be taken away. Words like **lost, ate, sold, gave away, broke, ran away,** and **carried away** are words of this kind. Can you think of any more words that mean take away?
3. Read each problem with care before you start to work it. If you find a word that means something is taken away, you should subtract. Look for such words in the problems below.

4. Bill had 10 marbles. He lost 2 of them. How many marbles did he have left? 8
5. Ann bought 6 cookies. She ate 2 cookies. How many cookies did she have left? 4
6. Tom made 8 bird houses. He sold 6 of them to the other boys and girls. How many bird houses did Tom have then? 2
7. Mother made 24 nut cookies. She gave the children 10 cookies for their party. How many cookies did Mother still have? 14
8. Last year Mary had 36 balls for the Christmas tree. Joe broke 3 balls when he took down the tree. How many Christmas tree balls does Mary have now? 33
9. Our teacher had 60 sheets of drawing paper. The boys and girls used 40 sheets of it. How many sheets of drawing paper were left? 20

Give pupils opportunity to discuss ex. 1-2. Provide reading help for slow readers. Have pupils pick out words in ex. 1-18 that tell them to subtract.

10. Jack had 9 rabbits. Last week 2 rabbits ran away. How many rabbits does Jack still have? 7

11. Peggy put 12 pieces of bread under a tree. The birds carried away 8 pieces. How many pieces were left under the tree? 4

12. Mother has enough milk to fill 4 glasses. She wants Peter to drink 3 glasses of milk today. How many glasses of milk will be left? 1

13. Betty had 24 paper cups. She took them on a picnic and 10 cups were used. How many cups were left? 14

14. Susan saw 16 birds in a tree. Then 9 birds flew away. How many birds were left in the tree? 7

15. Mother saw 28 yellow flowers in her garden. She picked 12 of them. How many yellow flowers were left in Mother's garden? 16

16. Make up a good subtraction problem about balloons. Use the word **broke** in your problem and the numbers 12 and 3.

17. Make up a good subtraction problem about pennies. Use the word **spent** in your problem and the numbers 17 and 8.

18. Make up a good subtraction problem about candles on a birthday cake. Use the words **blew out** and the numbers 9 and 7.

Emphasize and add to class chart (see page 51).

If you know how many things there were at first and how many were taken away, you subtract to find how many are left.

Have pupils make up own problems using some of the subtraction words mentioned. Follow procedure of ex. 16–18. Let pupils illustrate them for scrapbooks.

Provide problem situations involving adding by endings.

Flowers to Sell

The children are going to sell flowers to earn money. They will buy new books for the school library. The girls are putting flowers in bunches. Dick and Bill picked the flowers for the girls.

1. Ann made a bunch of flowers with 6 yellow flowers, 4 white flowers, and 6 blue flowers. How many flowers did Ann put in that bunch? 16
2. Susan made a red, white, and blue bunch. She used 6 red flowers, 6 white flowers, and 6 blue flowers. How many flowers did Susan use all together? 18
3. Betty is using 8 orange flowers, 6 blue flowers, and 5 white flowers for a bunch. How many flowers in all will Betty put in that bunch? 19
4. Alice's mother asked Alice to make her a bunch of flowers. She wanted 6 white flowers, 6 yellow flowers, 3 blue flowers, and 3 orange flowers. How many flowers will be in the bunch for Alice's mother? 18

Stress relationship between basic facts and adding-by-endings facts. Note pupils who have not mastered skill. Use adding-by-endings cards to give further practice and speed up response.

5. Peggy made a pretty bunch of flowers. She used 6 large yellow flowers, 6 small yellow flowers, 3 white flowers, and 4 blue flowers. How many flowers did Peggy put in that bunch? 19

6. Dick picked 72 flowers and Bill picked 96. How many flowers did both boys pick? 168 How many more flowers did Bill pick than Dick? 24

Add these numbers. Check your work: Stress.

7.	8	5	7	5	8	7	7	9	6
	5	3	8	4	9	7	7	4	8
	4	6	6	8	5	5	3	6	7
	17	14	21	17	22	19	17	19	21
8.	2	4	4	2	8	3	5	6	7
	3	3	4	4	5	8	2	1	2
	6	7	5	5	6	4	7	8	4
	5	8	6	4	3	7	6	5	3
	16	22	19	15	22	22	20	20	16

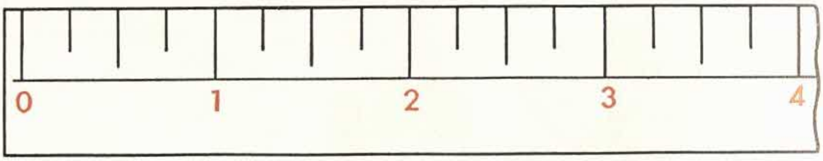
Use ex. 7–8 to develop mental arithmetic skills. Group pupils for special practice if needed.

Introduce the foot and the inch as linear measures. Provide instruction in the proper use of the ruler.

Foot and Inch

1. The children are making Christmas toys of wood. Jack is measuring a board to mark the place to saw. He is using a ruler. He wants to make the board 10 inches long. Jack's ruler is 12 inches long.

2. This picture shows part of a foot ruler. This part



of the ruler shows 4 inches. An inch is the length from one number to the next. Do you know how many inches there are on a foot ruler?

Emphasize this as a standard measure of length.

A foot ruler is 12 inches long.

Instruct pupils to start measuring from the zero mark or from the end of the ruler in case the scale starts there.

3. On the blackboard draw a line you think is 1 foot long. Do not use a ruler. Measure your line with your ruler to see how near you came to 1 foot.

Provide many experiences for pupils to measure things to the nearest inch with their rulers.

Measuring Things

Use a foot ruler for these exercises:

4 inches

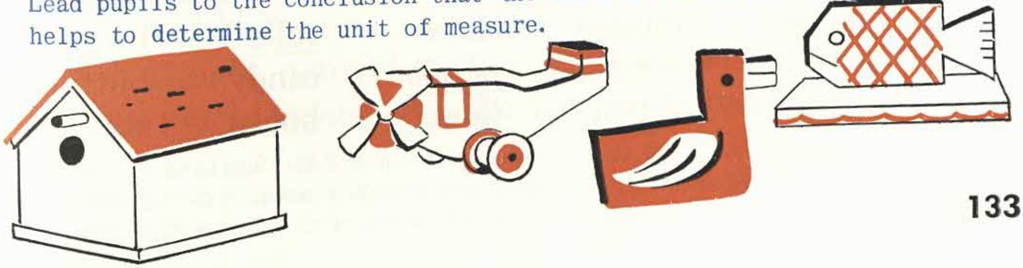
3 inches

1 inch

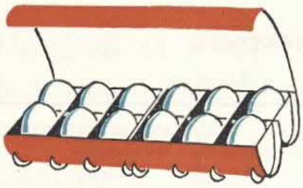
2 inches

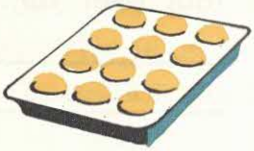
1. Look at the lines above. Try to tell how many inches long each line is. Then measure each one with your ruler. How many of your guesses were right?
2. Ask a friend to draw 3 different lines on paper. Then try to guess how long each one is. Write your answer near each line. If your answers were wrong, ask another friend to draw lines for you. Try again.
3. How many inches long is your pencil? Is it more or less than 1 foot long?
4. Look for something in the room that you think is a little longer than 1 foot. Can you find three things a little longer than 1 foot? What are they?
5. Things a little longer than 1 foot are often measured in feet and inches. On the blackboard draw a line that you know is a little longer than 1 foot. Measure it in feet and inches.
6. Look at the table in your room at school. Is it longer than 1 foot? Is it longer than 2 feet? Measure the table in feet and inches. How many feet and inches long is it? How many feet and inches wide is it?

Defer measurements to the fractional part of an inch until later. Lead pupils to the conclusion that the size of the object measured helps to determine the unit of measure.



Learning about Dozen





1. Count the eggs in the box. How many eggs are there? 12 This box holds a **dozen** eggs. How many eggs are there in 1 dozen? 12

2. Count the little cakes in the pan. How many cakes are there? 12 Does the pan hold 1 dozen cakes? Yes

Emphasize and add to vocabulary list.

12 things = 1 dozen things

3. Mother bought a dozen red roses and a dozen white roses. How many roses did Mother buy in all? 24

4. Mother gave 6 white roses to Mary for her birthday. How many white roses did she have left? 6

5. Mother took Grandmother 4 red roses. How many red roses did Mother have left? 8

6. Try to name 2 things you eat that are sold by the dozen. Try to name 2 things you do not eat that are sold by the dozen. Answers may vary.

7. Jack keeps hens. Yesterday he got 5 eggs and today he got 5 more. Did Jack get a dozen eggs in all? 10 eggs; no

8. Which of these things are sold by the dozen? *

cookies
tickets
apples
oranges
sugar
ribbon
shoes
pencils
flowers
rolls
candy
books
bread
buttons
stamps

*Practices of selling things by the dozen are not uniform throughout the country, so observe the practices in your area. Have pupils cut, mount, post pictures, and make up problems about things that are sold by the dozen.

This page provides further practice in differentiating between addition and subtraction problems.

Mixed Problems

1. Dick earned 35¢ for carrying wood for the fireplace. Then he earned 60¢ for cleaning snow off the sidewalk. How much did Dick earn all together? 95¢

2. Susan spent 20¢ to ride on the bus, 25¢ for lunch, and 10¢ for candy. How much did Susan spend all together? 55¢

3. Last year 285 girls and 242 boys in our school did not miss a day of school. How many more girls than boys did not miss a day of school? 43

4. Peter has 60¢. He wants to buy a new game that costs 95¢. How much more money does he need? 35¢

5. Bill went to the store for his mother. He bought cookies for 31¢, a can of corn for 20¢, and bread for 18¢. How much did Bill pay for these things? 69¢

6. Peggy wants to buy colored paper for 9¢, white paper for 7¢, a pencil for 5¢, and crayons for 8¢. How much money does she need to buy all these things? 29¢

7. Yesterday 120 people came to our school play in the afternoon. At night 175 people came. How many people all together came to see our play? 295

8. How many more came at night to see our play than in the afternoon? 55 Use the numbers in ex. 7 to find the answer.

9. Bob bought a toy for 40¢. He gave the man 50¢. How much money did the man give back to him? 10¢

More advanced pupils may omit this review. Let them work on original problems, puzzles, magic squares, and so on, for display in the arithmetic corner or in scrapbooks. Have other pupils discuss problems, giving reasons for the process used.

Provide readiness for the lesson by reviewing that 10 pennies have the same value as 1 dime.

Carrying in Addition

1. Problem Betty needs 25¢ for ribbon and 36¢ for buttons. How much money in all does Betty need?

Explanation The picture shows how much money Betty needs:

Ribbon costs

Buttons cost

How many dimes does Betty need? 5 How many pennies does she need? 11 How many cents is this in all? 61¢

Write the work like this and add:

2 dimes 5 pennies
3 dimes 6 pennies
5 dimes 11 pennies, or 6 dimes and 1 penny

Betty needs 61¢ all together.

Stress. You can also write the work as shown at the right. Think, "6¢ + 5¢ = 11¢, or 1 dime and 1 cent." Write 1 in cents place. Carry 1 dime to the dimes column and add it to 3 dimes. Think, "4 dimes + 2 dimes = 6 dimes." Write 6 in dimes place. The answer is 61¢.

$$\begin{array}{r} 25\text{¢} \\ +36\text{¢} \\ \hline 61\text{¢} \end{array}$$

Add these dimes and pennies. Use toy money to help you:

2.	39¢	68¢	53¢	55¢	47¢	25¢	44¢
	26¢	17¢	28¢	35¢	47¢	57¢	19¢
	65¢	85¢	81¢	90¢	94¢	82¢	63¢
3.	17¢	26¢	79¢	36¢	18¢	66¢	49¢
	29¢	47¢	19¢	35¢	56¢	24¢	38¢
	46¢	73¢	98¢	71¢	74¢	90¢	87¢

Have pupils find solution to ex. 1 with play money. Demonstrate with large paper coins in display chart. Have pupils do ex. 2 in the same way and ex. 3 without using play money.

Introduce the changing of 10 ones to 1 ten in addition as related to changing 10 pennies to 1 dime on page 136.

More Carrying

1. **Problem** There were 19 girls and 26 boys on the school bus this morning. How many children in all were on the bus? 45

Explanation Use the short way to add these numbers.

$$\begin{array}{r}19\\+26\\\hline 45\end{array}$$

Think, "6 ones + 9 ones = 15 ones." Change 15 ones to 1 ten and 5 ones. Write 5 in ones place. Carry 1 ten to tens column and add it to 2 tens, making 3 tens.

Think, "3 tens + 1 ten = 4 tens." Write 4 in tens place. The answer is 45. How many children were on the bus? 45

Check the answer by adding down. Think "9, 15." Write 5. Carry 1 and add it to 1. Think "2, 4." Write 4. The sum is 45 again, so the work is right.

2. In Miss Brown's room there are 15 boys and 18 girls. How many children are there in the room? 33

Add these numbers. Begin at the bottom and add up. Check your work by adding down: Stress.

3.	$\begin{array}{r}48\\28\\\hline 76\end{array}$	$\begin{array}{r}69\\21\\\hline 90\end{array}$	$\begin{array}{r}55\\38\\\hline 93\end{array}$	$\begin{array}{r}23\\29\\\hline 52\end{array}$	$\begin{array}{r}37\\56\\\hline 93\end{array}$	$\begin{array}{r}57\\28\\\hline 85\end{array}$	$\begin{array}{r}15\\46\\\hline 61\end{array}$	$\begin{array}{r}18\\33\\\hline 51\end{array}$
4.	$\begin{array}{r}43\\37\\\hline 80\end{array}$	$\begin{array}{r}42\\48\\\hline 90\end{array}$	$\begin{array}{r}18\\65\\\hline 83\end{array}$	$\begin{array}{r}27\\26\\\hline 53\end{array}$	$\begin{array}{r}59\\19\\\hline 78\end{array}$	$\begin{array}{r}13\\17\\\hline 30\end{array}$	$\begin{array}{r}39\\23\\\hline 62\end{array}$	$\begin{array}{r}34\\48\\\hline 82\end{array}$
5.	$\begin{array}{r}39\\17\\\hline 56\end{array}$	$\begin{array}{r}48\\23\\\hline 71\end{array}$	$\begin{array}{r}25\\45\\\hline 70\end{array}$	$\begin{array}{r}16\\78\\\hline 94\end{array}$	$\begin{array}{r}24\\58\\\hline 82\end{array}$	$\begin{array}{r}19\\32\\\hline 51\end{array}$	$\begin{array}{r}17\\74\\\hline 91\end{array}$	$\begin{array}{r}28\\19\\\hline 47\end{array}$

More Practice. See ⑳ on page 319.

See if the pupils can discover for themselves how to regroup the sum using materials such as theater tickets or sticks which can be bundled by tens. Illustrate with large materials. Be sure pupils immediately add the ten carried.

Continue to emphasize the meaning behind regrouping the sum in addition.

Carrying in Addition

Add up. Check your work by adding down: Stress.

1.	13 59 72	47 26 73	26 59 85	54 26 80	27 19 46	25 67 92	28 26 54	67 23 90
2.	49 38 87	23 48 71	16 25 41	58 34 92	44 17 61	75 18 93	14 49 63	39 45 84
3.	22 39 61	49 46 95	36 27 63	37 38 75	59 19 78	38 52 90	61 19 80	36 14 50

4. **Problem** Jim bought two packages of stamps for his stamp book. In one package there were 75 stamps. In the other package there were 85 stamps. How many stamps did Jim buy? 160

Explanation Think, "5 + 5 = 10." Write 0 in ones place. Carry 1 ten to tens column and add it to 8, making 9.

75
+85
160

Think, "9 + 7 = 16." 16 means 16 tens. Write 6 in tens place and 1 in hundreds place. The sum is 160. Jim bought 160 stamps.

Add up. Check by adding down: Stress.

5.	87 55 142	76 87 163	94 46 140	75 96 171	62 89 151	95 15 110	86 99 185	97 27 124
6.	56 96 152	33 98 131	99 97 196	84 88 172	82 68 150	75 47 122	39 73 112	69 95 164
7.	61 49 110	88 22 110	79 66 145	44 67 111	89 38 127	86 45 131	54 89 143	78 37 115

More Practice. See ㉑ on page 320.

Have pupils demonstrate some of the examples using a place-pocket chart or an abacus. In ex. 4, point out that 16 tens may be thought of also as 1 hundred and 6 tens. Write such sentences as: 7 tens + 15 ones = 8 tens + 5 ones.

Illustrate carrying in addition in problems.

Seeds to Sell

1. **Problem** Jack sold 22 packages of seeds on Monday, 27 packages on Tuesday, and 15 packages on Wednesday. How many packages of seeds did Jack sell in the three days? 64

Explanation Add the three numbers like this: Begin at the bottom and add up. Think "5, 12, 14." Write 4 in ones place. Carry 1 ten to the bottom of tens column and add it to 1, making 2.

$$\begin{array}{r} 22 \\ 27 \\ \underline{15} \\ 64 \end{array}$$

Think "2, 4, 6." Write 6 in tens place. The sum is 64. Jack sold 64 packages of seeds in three days.

Check by adding down. Think "2, 9, 14." Write 4. Carry 1 and add it to 2. Think "3, 5, 6." Write 6. The sum is 64 again, so the work is right.

2. Betty sells seeds, too. She sold 18 packages one day, 23 packages the next day, and 25 packages the third day. How many packages did Betty sell in all? 66

Have pupils make up similar problems for class to solve. Give pupils who have difficulty opportunity to use pocket chart to demonstrate sums.

Column Addition

Add these numbers. Check your work: Stress.

1.	25	39	28	21	62	49	38	28
	34	20	33	16	11	14	25	23
	39	33	25	57	19	23	16	47
	98	92	86	94	92	86	79	98
2.	28	38	48	37	46	27	54	27
	54	20	41	64	55	63	47	43
	47	76	13	25	27	49	27	38
	129	134	102	126	128	139	128	108

Write these numbers in columns and add:

3. 25 + 22 + 39 86   47 + 14 + 33 94   65 + 25 + 45 135

4. 38 + 34 + 25 97   56 + 75 + 26 157   74 + 36 + 65 175

5. Problem This week Tom earned 25¢, 39¢, and 29¢. How many cents did Tom earn in all? 93¢

Explanation Add the three numbers at the right as you did on page 139. Think "9, 18, 23." Write 3 in ones place. This time there are 2 tens, so 2 is the number to carry. Think "4, 7, 9." Write 9 in tens place. The sum is 93. Tom earned 93¢ in all.

25
39
29
93

Add these numbers. Check your work: Stress.

6.	39	27	15	26	17	49	55	68
	17	29	58	19	19	39	47	25
	38	26	18	45	57	39	29	58
	94	82	91	90	93	127	131	151
7.	59	18	68	75	39	46	58	47
	46	66	28	66	68	59	25	28
	16	47	57	29	39	28	49	55
	121	131	153	170	146	133	132	130

More Practice. See ㉒ on page 320. Use to reinforce skill.

Encourage more advanced pupils to do some examples mentally. Have other pupils talk out answers. Let them use pocket chart, since exchange involves more than 1 ten.

Present arithmetic experiences in holiday situation.

Christmas Party at School

1. The children in Miss Wood's room are working to get ready for a Christmas party this afternoon. There are 19 boys and 20 girls in her room. How many children are there in all? 39

2. The girls want to make 50 stars to put on the tree. They made 30 stars yesterday and are making the rest of them today. How many stars will they make today? 20

3. Some of the children made long paper ropes for the tree. They spent 25¢ for red paper, 30¢ for green paper, and 25¢ for white paper. How much did they spend in all for the paper? 80¢

4. Miss Wood gave Bill 90¢ to buy pretty balls for the tree. He spent only 80¢. How much money did he have left? 10¢

5. Miss Wood bought 48 candy canes in one box and 20 in another. How many candy canes did she buy all together? 68

6. Miss Wood did not put all 68 candy canes on the tree. She put 40 of them in a box for the children. Jack put the rest of them on the tree. How many candy canes did Jack put on the tree? 28

7. Miss Wood had 40 candy canes for the children. Could each child have a cane? Yes, 1 left over

Urge pupils to figure own Christmas budgets.

Helping Father

Teach addition of 1-and 2-place numbers.

1. Jack helped his father in the store last Saturday. He sold Mrs. White bread for 22¢, carrots for 9¢, and a can of corn for 23¢.

Jack wrote the numbers as shown at the right. He could not add the numbers and asked his father to help. Ask pupils why.

$$\begin{array}{l}22\\9\\\underline{23}\end{array}$$

Jack's father said Jack must write the numbers in columns. The ones go in the ones column and the tens in the tens column, as shown at the right. Then Jack could add the numbers. Tell how Jack added.

$$\begin{array}{r}22\\9\\\underline{23}\\54\end{array}$$

2. Mary's mother bought a dozen eggs for 57¢, a can of fish for 25¢, and carrots for 9¢. How much did she pay for these things? 91¢

Illustrate ex. 1 using large paper coins inserted into a display chart. Stress the importance, when writing numbers on paper, of writing the ones in the ones column and the tens in the tens column.

3. Peter bought milk for 23¢, cookies for 19¢, a bag of sugar for 49¢, and an orange for 6¢. How much did Peter have to pay? 97¢

4. Jim's mother bought ice cream for 39¢, an apple for 5¢, and a package of nuts for 37¢. How much did these things cost? 81¢

5. Jack sold Mrs. Green a cake for 65¢, a candy bar for 8¢, and some apples for 25¢. How much in all did Mrs. Green pay Jack? 98¢

6. Mrs. Hill bought a bunch of carrots for 9¢, cookies for 19¢, milk for 23¢, and oranges for 29¢. How much did Mrs. Hill pay for these things? 80¢

7. Here are other numbers Jack had to add. Write them in columns on your paper. Add and check:

46	16	9	33	46	27	57	15
6	27	43	4	7	62	5	17
18	48	34	59	32	9	18	19
70	91	86	96	85	98	80	51

More Practice. See ㉓ on page 321.

Follow plan of page 142: let different pupils show money values on display chart, and others then write numbers in column form. Some pupils may need to use pocket chart to find sums in ex. 7.

Provide practice in skill of adding by endings.

Problems and Practice

1. Next Saturday 3 groups of children from our school will go to a big farm. There are 33 children in one group, 29 in another, and 30 in the third. How many children are there all together? 92

2. There will be 3 busses to carry all the children and 3 teachers to the farm. Each bus can carry 32 people. Add to find how many people 3 busses can carry. 96 Will 3 busses be enough to take the children and teachers to the farm? Use your answer to ex. 1. 92 + 3 = 95; yes

3. Suppose 7 children cannot go to the farm on Saturday. Will 2 busses be enough to take the other children and 3 teachers? 2 busses can carry 64 people; 95–7 = 88 people to go; 2 busses will not be enough.

Write these numbers in columns. Then add and check: Stress.

4. 43 + 29 + 43 115 66 + 53 + 68 187
5. 76 + 76 + 67 219 1 + 82 + 97 180
6. 84 + 57 + 15 156 69 + 82 + 75 226
7. 5 + 62 + 49 116 53 + 64 + 96 213
8. 95 + 48 + 42 185 33 + 7 + 99 139
9. Find the sum of 11, 8, 9, 14; 42 of 52, 47, 36. 135
10. How many cents are 15¢, 8¢, 21¢, and 12¢? 56¢

Add these numbers and check your work:

11.	88	75	57	19	3	29	82	55
	39	25	38	76	43	24	36	29
	127	100	95	95	46	53	118	84
12.	37	15	4	13	66	16	49	88
	36	48	39	27	39	54	8	25
	73	63	43	40	195	70	57	113

Urge brighter pupils to do ex. 4-8 in form shown. Have pupils who have difficulty add orally to check understanding of process. Let them use pocket chart if necessary.

Provide oral review of concepts and skills.

Yes or No?

Read each exercise carefully. Then tell whether it is "true" or "false."

1. A week after January 9 is January 16. True
2. A foot is more than 16 inches. False
3. The sum of 375 and 200 is 575. True
4. A half dozen flowers is 6 flowers. True
5. 14 inches are 4 inches more than 1 foot. False
6. 3974 = 3000 + 900 + 70 + 4. True
7. 8 books and 7 books make 15 books. True
8. The sum of 4¢, 1¢, 3¢, and 5¢ is 15¢. False
9. A dozen eggs is the same as 12 eggs. True
10. 4 nickels are the same as 20 cents. True
11. One fourth and one quarter mean the same thing. True
12. The month of February has 28 days this year.
13. 396 is the largest number that uses 3, 6, and 9. False
14. It is an hour from half past four to five o'clock. False
15. The two numbers after 1008 are 1009 and 1010. True
16. A quarter is the same as 1 dime and 4 nickels. False
17. The number 136 means 1 hundred 3 tens 6 ones, or 13 tens and 6 ones. True
18. Ann cut a pie into 4 equal pieces. Each piece is one quarter of the whole pie. True
19. Bill had a board 18 inches long. He cut off a piece 10 inches long. Then he had 9 inches left. False

Use review to spot-check class or individual weaknesses.
Provide more practice or drill, based on pupils' needs.

Provide opportunity for pupils to discover for themselves how to regroup the minuend in ex. 1 prior to studying the explanation.

Changing in Subtraction

1. Bill had 32¢. He wanted to pay Jack 15¢ for a top. Bill had only 3 dimes and 2 pennies, so he could not give Jack 15¢. Bill had one of his dimes changed into 10 pennies. Then he had 2 dimes and 12 pennies. Did he still have 32¢? After he paid Jack, how much did Bill have left? 17¢ Yes

You can write the work in this way:

3 dimes 2 pennies	=	2 dimes 12 pennies	$\overset{2\ 12}{\cancel{3}\cancel{2}}$
1 dime 5 pennies	=	1 dime 5 pennies	$-\ 15$
		1 dime 7 pennies	17

Bill had 17¢ left.

2. **Problem** Ann had 42¢. She wanted to pay Sally 24¢ for a doll's dress. How much would Ann have left? 18¢

Explanation Write 24 under 42 and subtract.

$$\begin{array}{r} \overset{3\ 12}{\cancel{4}\cancel{2}} \\ -24 \\ \hline 18 \end{array}$$

You cannot subtract 4¢ from 2¢ because 4 is larger than 2. You know that 42¢ is 4 dimes and 2 pennies. Take 1 of the 4 dimes and change it to 10 pennies. 10¢ + 2¢ = 12¢. Think, "4¢ from 12¢, 8¢." Write 8 in cents place. Remember that 1 of the 4 dimes has been changed to cents, so there are only 3 dimes left. Think, "2 dimes from 3 dimes, 1 dime." Write 1 in dimes place. Ann would have 18¢ left.

Have pupils explain several examples in ex. 3 orally.

Subtract these numbers. Use play money to help you:

3.						
43¢	74¢	85¢	93¢	77¢	70¢	80¢
28¢	57¢	19¢	36¢	58¢	46¢	35¢
15¢	17¢	66¢	57¢	19¢	24¢	45¢

More Practice. See ㉔ on page 321.

To the Teacher. See page 328 for the additive method of subtraction.

After an opportunity has been provided for individual discovery, have pupils follow explanations of ex. 1–2 with their play money. Emphasize on the board the two ways of writing the work in ex. 1. Ask pupils to explain the meaning of the small helping figures.

Relate changing a ten to 10 ones to changing a dime to 10 pennies. Provide opportunities for pupil discovery.

More Changing (or Borrowing)

1. **Problem** Bob had 45 papers to sell. He sold 28 in an hour. How many papers did he have left then? 17

Explanation You must subtract 28 from 45. You can think as you did in Problem 2 on page 146, or you can make the work shorter in this way:

You cannot take 8 ones from 5 ones, so take 1 of the 4 tens and change it to 10 ones. 10 ones and 5 ones are 15 ones. Think, "8 ones from 15 ones, 7 ones." Write 7 in ones place. You changed 1 of the 4 tens, so there are only 3 tens left. Think, "2 tens from 3 tens, 1 ten." Write 1 in tens place. The answer is 17. So Bob had 17 papers left. The answer 17 is called the **remainder.**

$$\begin{array}{r} {}^{3}\ {}^{15} \\ \cancel{4}\cancel{5} \\ -28 \\ \hline 17 \end{array}$$

To check the work above, add 17 and 28. Think, "7 + 8 = 15." Carry 1 ten to tens column and think, "1 (carried) + 1 + 2 = 4." The sum is 45, so the answer is right.

In these problems, think as you did above:

2. Mary Ann had 25 paper dolls. She gave 16 to her sister. How many paper dolls did she have left? 9

3. Peter earned 15¢ this morning. He wants to buy a toy truck that costs 90¢. How much more money does Peter need? 75¢

4. Sally wants to practice her music lesson 40 minutes after school. She has practiced 25 minutes. How many more minutes does she need to practice? 15

To the Teacher. See page 328 for the additive method of subtraction.

Following opportunities for individual discovery, demonstrate how 1 ten is changed to 10 ones using place-pocket chart or abacus. Show that there is no need to change more than one ten to ones.

Many pupils should be able to work independently on this page. Others may still need to work with manipulative materials.

Subtraction Practice

Subtract these numbers. Check your work by adding:

1.	92	64	91	80	75	72	61	93
	58	15	78	29	19	36	45	15
	34	49	13	51	56	36	16	78
2.	51	93	40	82	71	60	94	91
	24	34	27	59	53	24	48	67
	27	59	13	23	18	36	46	24
3.	73	82	65	71	94	81	52	83
	48	43	37	26	26	62	14	39
	25	39	28	45	68	19	38	44

4. **Problem** Peter has 142 stamps. His brother has 89 stamps. How many more stamps has Peter than his brother? 53

$$\begin{array}{r} {\scriptstyle 13\ 12} \\ \cancel{142} \\ \underline{89} \\ 53 \end{array}$$

Explanation You cannot take 9 ones from 2 ones. So change 1 ten to 10 ones and put them with 2 ones, making 12 ones. 1 hundred and 4 tens are the same as 14 tens. Since you changed 1 ten, there are 13 tens left. You now have 13 tens and 12 ones. Think, "12 − 9 = 3." Write 3 in ones place. Then think, "13 − 8 = 5." Write 5 in tens place. The remainder is 53. Peter has 53 more stamps than his brother.

Subtract. Check your work by adding:

5.	154	130	117	140	193	124
	79	52	58	63	97	87
	75	78	59	77	96	37
6.	125	176	162	188	145	112
	98	89	67	99	97	38
	27	87	95	89	48	74

More Practice. See ㉕ on page 321.

To the Teacher. See page 328 for the additive method of subtraction.

Make sure that pupils are not just operating mechanically in subtracting. Have slower pupils explain orally how to subtract in ex. 1–3. In ex. 5–6, illustrate regrouping the minuends this way: 15 tens + 4 ones = 14 tens + 14 ones.

Review basic addition and subtraction thought patterns (pages 149–150).

Review Problems

1. Jim wants to buy a box of paints. It costs 95¢. Jim has 60¢ now. How much more money does he need for the paints? 35¢

2. Suppose Jim earns a quarter, a dime, and a nickel. Will he have enough to buy the paints? 25¢ + 10¢ + 5¢ = 40¢; yes

3. In September Ann had 24 sheets of drawing paper. So far she has used 11 sheets of it. How many sheets of Ann's drawing paper are left now? 13

4. Betty ate lunch at school. She paid 10¢ for milk, 12¢ for a sandwich, and 7¢ for an apple. How much did Betty's lunch cost? 29¢

5. Bill had 75 stamps in his book. He bought 36 more and Uncle Jim gave him a package of 50 stamps. How many stamps did Bill have then? 161

6. Dick had 75¢ this morning. He paid 35¢ for his school lunch. How much money did Dick have left? 40¢

7. At the store Susan paid 25¢ for a game. She also paid 25¢ for a book. How much money did Susan spend at the store? 50¢

8. In a game Peter got 6 points, 9 points, 5 points, and 8 points. What was Peter's score in the game? 28

9. In the same game Mary got 7 points, 4 points, 10 points, and 6 points. What was her score? 27 Which score was better, Mary's or Peter's? Peter's

Have pupils pick out key words or expressions that tell them to add or subtract. Remind them to read problems carefully (see page 91).

Can You Do These Problems?

1. In the park 18 children were playing ball and 12 were skating. How many children in all were in these two groups? 30

2. Ann wants to practice her music lesson 50 minutes today. After lunch she practiced 15 minutes. How many more minutes does she need to practice to make the time 50 minutes? 35

3. At the Christmas party there were 35 children. 19 were girls and the rest were boys. How many boys were at the party? 16

4. Jim has some hens. On three days this week he got 5 eggs, 8 eggs, and 4 eggs. How many eggs did Jim get all together? 17 Is this number more than or less than 1 dozen? More

5. Jane wants to buy a game that costs 90¢. She now has 53¢. How much more money does Jane need? 37¢

6. Today 24 boys and 22 girls went by bus to the park. How many children went to the park? 46

7. They saw 6 brown bears, 3 white bears, and 8 black bears. How many bears in all did the children see? 17

8. Behind a fence they saw 8 lions. Five lions were sleeping. The other lions were walking near the fence. How many lions were near the fence? 3

Present completion test. Review terms used in chapter.

Do You Know the Right Word?

Tell the right word that goes in each space. Then on your paper try to write the word:

1. A quarter is equal to five . . . nickels.
2. There are 12 inches in a . . . foot.
3. The 1 in 1873 is in . . . place. thousands
4. Wednesday is the next day after . . . Tuesday.
5. There are 30 minutes in a . . . half hour.
6. January is the first . . . month of the year.
7. 6 + 4 = 10 is called an addition . . . fact.
8. The sixth month in the year is . . . June.
9. 10 hundred is the same as 1 . . . thousand.
10. Another name for 12 eggs is one . . . dozen eggs.
11. The word that means **not any,** or **none,** or **0,** is . . . zero.
12. The remainder is the answer you get in . . . subtraction.
13. When you find the sum of some numbers, you . . . add.
14. To find how many more one number is than another, you must . . . subtract.
15. When a cake is cut into 4 equal pieces, each piece is one . . . of the cake. fourth or quarter
16. A pencil is shorter than one . . . foot. Use **inch** or **foot** for your answer.
17. The long hand of the clock moves from 12 to 3 in 15 . . . minutes, or a quarter of an . . . hour.
18. You need more money to buy a book. To find how many more cents you need, you . . . subtract.

Have pupils number a lined piece of paper on which to write answers. Note areas of weakness and plan for further review.

Maintain skill of changing in subtraction. Prepare for chapter test.

Watch the Answer

1. After school 21 girls and 15 boys rode home in the school bus. How many more girls than boys rode home? 6

   21
   −15
   6

2. Mary had 50¢ this morning. She spent 44¢ for a book. How many cents did Mary have left? 6¢

   50
   −44

3. Dick earned 35¢ and Bill earned 40¢. How much less did Dick earn than Bill? 5¢

   40
   −35

In the problems above, you get 0 when you subtract the tens. But you do not need to write 0 in the answer since an empty space shows that there are no tens.

Subtract. Check your work by adding up: Stress.

4.	65	93	56	32	84	72	67	23
	48	85	37	25	68	69	38	19
	17	8	19	7	16	3	29	4
5.	91	64	82	58	53	85	41	42
	59	59	43	49	24	77	37	26
	32	5	39	9	29	8	4	16
6.	36	93	74	82	94	90	63	65
	28	76	65	57	86	64	28	59
	8	17	9	25	8	26	35	6
7.	42	57	84	95	23	41	56	82
	34	19	77	46	17	18	49	38
	8	38	7	49	6	23	7	44

More Practice. See ㉖ on page 322. Use for reteaching.

8. How many cents are left if you take 19¢ from 28¢? 9¢

9. Peter had 25 tickets to sell for a ball game. He has sold 18 tickets so far. How many tickets has Peter left to sell? 7

All pupils should do ex. 1–3 and ex. 8–9 orally. Let some demonstrate on pocket chart. Urge brighter pupils to do ex. 4–7 orally (form own group). Note errors on progress cards.

Mixed Problems

1. Jane has new roller skates. Today she skated 20 minutes after lunch and 35 minutes after school. How many minutes did Jane skate today? 55

2. Jim had 90¢ when he went to a ball game. When he came home he had 26¢ left. How many cents had Jim spent? 64¢

3. After school the school bus took 52 children home. There were 35 girls in the bus. How many boys were there? 17

4. Alice wanted to skate after school. She went out at half past three. Her mother said she could skate for 45 minutes. At what time should Alice go home? 4:15 Look at a clock to find the answer.

5. Alice went home at 10 minutes after 4. Did she stay out more or less than 45 minutes? Less See ex. 4.

6. Dick has 32 chickens. He counted 26 chickens when he gave them water today. How many chickens were missing then? 6

7. When Ann went to the store she had 85¢. When she got home she had 8¢ left. How much did Ann spend at the store? 77¢

8. Ann tried to check what she had spent. She had bought paper for 25¢, birthday cards for 34¢, and pencils for 18¢. Does the sum check with the answer to ex. 7? 77¢; yes

Brighter pupils may omit this page. Let them work at the arithmetic corner. Have other pupils talk out solutions to problems to check logical thinking.

How Many Are Gone?

Present concepts "how many are gone" and "how much is spent."

1. Dick had 9 puppies. He has only 4 left. He sold the rest. How many puppies did he sell? 5
2. Dick also had 10 rabbits. After school he could find only 6 rabbits. How many rabbits had run away? 4
3. Jane had 15¢. Now she has only 10¢ left. How much money did she spend? 5¢
4. Mother made 48 cookies. After dinner only 27 of them were left. How many cookies did the family eat? 21

Stress and add to class chart.

Suppose you know how many things you had at first and how many you have now. You subtract to find how many are gone.

Suppose you know how much money you had at first and how much you have now. You subtract to find how much you spent.

Have pupils make up and illustrate similar problems, using these subtraction concepts, for class to solve. Post some on bulletin board for further reference.

Prepare for chapter test and diagnostic test.

Review Practice

1. How much more than 28¢ is 53¢? 25¢
2. Find the sum of 8¢, 7¢, 5¢, and 6¢. 26¢
3. How many cents do 3 dimes and 1 nickel make? 35¢
4. Jim's pencil is 7 inches long. Is it more than or less than 1 foot long? How much more or less is it? 5 inches less

Subtract these numbers. Check your work: Stress.

5. 77	67	95	86	142	378	280
46	19	46	74	85	325	130
31	48	49	12	57	53	150
6. 51	62	53	86	145	124	467
27	48	34	35	53	38	405
24	14	19	51	92	86	62
7. 92	90	36	93	108	133	638
40	24	29	86	79	49	216
52	66	7	7	29	84	422
8. 75	95	46	95	150	111	139
39	12	28	65	76	58	73
36	83	18	30	74	53	66

Write in columns and add or subtract:

9. 137 − 68 69   105 + 74 179   979 − 750 229   162 − 83 79

10. 124 + 54 178   126 − 96 30   234 + 352 586   150 − 97 53

Write these numbers in columns. Then add and check: Stress.

11. 58 + 43 + 26 127   49 + 76 + 42 167

12. 27 + 94 + 39 160   57 + 63 + 9 129

13. 46 + 75 + 83 204   68 + 57 + 34 159

14. 98 + 23 + 63 184   58 + 76 + 61 195

15. 85 + 66 + 63 214   326 + 9 + 54 389

Use this page as oral review for brighter pupils and written review for others. Note weaknesses on pupils' progress cards. Regroup for reteaching, using materials and "More Practice" pages.

Consult the Teacher's Guide for an explanation of how the test items are correlated with the aims of Chapter 4.

Chapter Review

Tell the sums:

1. 37 and 7 44 81 and 9 90 35 + 8 43 59 + 2 61
2. 16 and 5 21 54 and 7 61 47 + 6 53 28 + 4 32
3. 49 and 3 52 64 and 9 73 12 + 9 21 38 + 7 45
4. 86 and 6 92 29 and 4 33 45 + 6 51 25 + 4 29
5. 18 and 3 21 28 and 6 34 39 + 8 47 46 + 4 50
6. 34 and 7 41 19 and 5 24 17 + 9 26 57 + 5 62

Add these numbers and check your work: Stress checking.

7.	3	6	1	4	2	9	4	7
	5	7	2	4	3	6	0	5
	8	8	7	9	6	4	4	4
	5	2	9	6	8	3	7	8
	21	23	19	23	19	22	15	24
8.	53	21	44	45	68	87	43	79
	34	20	26	36	57	8	29	7
	12	58	28	46	54	25	74	38
	99	99	98	127	179	120	146	124

Subtract and check your work:

9.	78	49	67	73	95	64	81	84
	15	39	39	25	46	48	25	56
	63	10	28	48	49	16	56	28

10. How many things are there in 1 dozen? 12

11. How many inches are there in 1 foot? 12

12. Is the blackboard longer than 1 foot? Yes

13. Is this book more or less than 10 inches wide? Less

14. Tom has a box 18 inches wide. Is this more than or less than 1 foot? How much more or less is it? 6 inches
More

Urge pupils to work quickly. Note errors on progress cards.
Plan further review based on class or individual weaknesses.

This is the fourth Problem Test. Try to get every problem right. Each problem counts 10.

1. Miss Fox had 36 pencils in a box. She gave the children 31 pencils. How many pencils were left? 5
2. Peggy's mother bakes cookies and sells them. Peggy sold 48 nut cookies and 96 sugar cookies for her. How many cookies did Peggy sell? 144
3. At the school store Peter spent 9¢, 5¢, 3¢, and 8¢. How much did he spend all together? 25¢
4. Betty had a birthday party last week. There were 30 children at the party and 17 of them were girls. How many boys were there? 13
5. Jim wants to practice his music lesson 45 minutes today. This morning he practiced 25 minutes. How many more minutes does Jim need to practice? 20
6. Susan had sold 35 tickets to the school circus. Today she sold 8 more. How many tickets has Susan sold? 43
7. Bill had 50 tickets to sell. Now he has only 13 tickets left. How many tickets has Bill sold? 37
8. Mary has cut out pictures for a book she is making. She has 25 pictures of birds, 9 pictures of animals, and 16 pictures of flowers. How many pictures has Mary cut out? 50
9. Jack made a toy boat 16 inches long. How much more than 1 foot is this? 4 inches
10. Jane's mother has roses in her garden. Today she picked a dozen red roses and a dozen white roses. How many roses did she pick today? 24, or 2 dozen

Check pupils' work to see if thought patterns, basic skills or processes, or carelessness are causes of difficulties. Remind pupils to read carefully and that answers should be reasonable.

Assign this diagnostic test of addition and subtraction skills. Observe the pupils as they work for signs of difficulty.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row and do the examples on those pages.

Add these numbers and check your work:

							Practice Pages
1.	31 34 24 89	24 20 45 89	32 34 31 97	13 22 32 67	46 13 60 119	42 45 22 109	122, 123
2.	17 5 22	39 8 47	7 29 36	58 6 64	9 83 92	7 44 51	124, 125
3.	58 35 93	16 26 42	65 19 84	49 76 125	67 63 130	56 48 104	137, 138
4.	19 51 24 94	37 15 67 119	45 98 33 176	74 69 37 180	47 78 69 194	87 88 28 203	140
5.	9 4 6 1 20	5 3 8 7 23	6 8 2 9 25	6 3 5 6 20	4 9 2 8 23	3 5 3 9 20	126, 131

Subtract these numbers and check your work:

6.	75 32 43	93 71 22	128 54 74	156 96 60	374 62 312	869 634 235	127
7.	74 45 29	91 39 52	66 18 48	83 27 56	150 65 85	117 39 78	147, 148
8.	34 29 5	60 51 9	73 65 8	80 74 6	41 36 5	92 87 5	152

Compare results with previous ones noted on progress cards (pages 152, 155-156). Have pupils make self-assignment from practice pages before beginning new work.

Introduce counting by thousands. Review reading of 4-place numbers. Consult Guide for specific aims of Chapter 5.

Chapter 5

Four-Place Numbers

1. Miss Fox took the children to a big library. They saw many, many books there. Bill said, "There must be a thousand books in this library. A thousand is ten hundred, you know." Mary laughed and said, "I think there are many thousands of books in this library." Mary was right. Miss Fox said there were 9500 books in all.

2. Miss Fox asked the children to count by thousands, like this: 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10,000

3. The number 9500 is a **four-place** number. It is read 9 **thousand** 5 **hundred,** or 95 **hundred.** Read each of these four-place numbers in two ways: 5600, 4900, 8400, 1700, 2500, 6100, 3200, 7800.

Continue to stress understanding of place value. Be sure pupils understand that 9500 means 9 thousands 5 hundreds, or 95 hundreds, or 950 tens, or 9500 ones. Provide opportunities for similar interpretation of other 4-place numbers.

Extend the pupils' understanding of the meaning of 4-place numbers as well as their ability to read and write them.

Four-Place Numbers

1. In a four-place number the first figure at the left stands for **thousands.** The number 4208 means 4 thousands 2 hundreds 0 tens 8 ones. It is read **four thousand two hundred eight,** or **forty-two hundred eight.** Sometimes a four-place number, such as a telephone number, is read like this: **four, two, o, eight.** When there is a zero in the number, it is read like the letter o.

Thousands	Hundreds	Tens	Ones
4	2	0	8

2. What does the number 5367 mean? You can show what it means by adding in this way: 5000 + 300 + 60 + 7. Add these numbers as shown at the right. You get 5367. Tell three ways to read 5367. Five thousand three hundred sixty-seven; fifty-three hundred sixty-seven; five, three, six, seven

$$\begin{array}{r} 5000 \\ 300 \\ 60 \\ 7 \\ \hline 5367 \end{array}$$

3. The number 2006 is read **two thousand six,** or **twenty hundred six,** or **two, o, o, six.** Read each of these numbers in three ways: 9008 5002 6015

4. On page 159 you counted by thousands. The next thousand after 9000 is 10,000. A comma is put after the thousands in a **five-place** number like 10,000. This makes the number easier to read. In a four-place number, the comma may be used or left out.

Read each number in two ways: Refer pupils to ex. 1.

5. 9875 2817 3280 5602 5139 3652

6. 5100 3060 2005 9999 8000 9604

7. Ask your teacher to read the numbers in ex. 5 and 6. Write the numbers as they are read.

8. Write in figures: two thousand one hundred nine. 2109

Emphasize that the value of each figure depends upon the place it occupies. Demonstrate what happens to the value of figures if zero is omitted, e.g. 307 and 37. Have pupils represent numbers in ex. 5-6 as in ex. 2 and also on an abacus.

Reading and Writing Dollars and Cents

1. You know that $4 means four dollars. The skates cost four dollars and ninety-five cents. You write it like this: $4.95. The dot goes **between** the dollars and the cents. The dot is called a **decimal point.**

2. You can also write four dollars like this: $4.00. This shows there are **no** cents.

3. You write fifty cents like this: 50¢ or $.50 or $0.50.

4. You write five cents like this: 5¢ or $.05 or $0.05.

5. Read the prices in the picture above. Three dollars and seventy-five cents; one dollar and forty cents; thirty dollars; four dollars and ninety-five cents

Read these prices:

Seven dollars Thirty-five dollars Ten cents

6. $7.00 $6.03 $35.00 $.87 $.10 $5

Six dollars and three cents Eighty-seven cents Five dollars

7. $1.40 $3.75 $10.25 $.09 $.40 $1

See Guide for answers to ex. 7.

Write these prices, using the sign $ and the decimal point:

8. 5 dollars and fifteen cents $5.15 8 cents $0.08

9. 8 dollars and sixty cents $8.60 4 cents $0.04

10. 4 dollars and seven cents $4.07 17 cents $0.17

Consult Guide for prelesson activity. Refer to decimal point as either a dot or a point that separates dollars from cents. Stress different ways of writing cents as in ex. 3–4. Provide further practice as needed.

Present column addition of 3-place numbers with the necessity of changing 10 cents to 1 dime.

Carrying in Three-Place Numbers

1. **Problem** Susan wants to buy roller skates for $4.69 and a sled for $5.29. How much will both cost? $9.98

Explanation Susan needs to add to find the cost of both. She writes the addition this way:

$4.69 =	4 dollars	6 dimes	9 cents
$5.29 =	5 dollars	2 dimes	9 cents
	9 dollars	8 dimes	18 cents

Susan knows that 18 cents equals 1 dime and 8 cents. Her answer is 9 dollars, 9 dimes, 8 cents, or $9.98.

You can also write the work as shown at the right. Think, "9¢ + 9¢ = 18¢." Change 18¢ to 1 dime and 8¢. Write 8 in cents place. Carry 1 dime to the dimes column and add it to 2 dimes.

$$\begin{array}{r} \$4.69 \\ +5.29 \\ \hline \$9.98 \end{array}$$

Think, "3 dimes + 6 dimes = 9 dimes." Write 9 in dimes place. Think, "$5 + $4 = $9." Write 9 in dollars place. Write the dollar sign. Put the decimal point in the sum under the other decimal points. The answer is $9.98. Check the work by adding down. Point out that the dollar sign is not repeated before each addend.

Add these numbers. If you need to, write the work as Susan did: Let pupils do first few examples this way.

2.	$1.27	$2.33	$5.68	$2.58	$1.37	$4.49
	4.64	6.18	3.22	1.37	1.49	2.31
	$5.91	$8.51	$8.90	$3.95	$2.86	$6.80
3.	$3.25	$3.26	$2.38	$4.08	$1.59	$5.27
	4.28	1.49	4.56	1.35	2.04	2.13
	$7.53	$4.75	$6.94	$5.43	$3.63	$7.40

More Practice. See ㉗ on page 322.

Stress adding cents to cents, dimes to dimes, dollars to dollars. Let some pupils demonstrate the exchange of cents using money display chart or play money.

More Carrying

1. **Problem** Bill has 147 stamps in his new stamp book. He has 128 more stamps to put in the book. How many stamps has he all together? 275

Explanation Use this way to add the numbers.

Think, "8 ones and 7 ones are 15 ones. 15 ones means 1 ten and 5 ones." Write 5 in ones place. Carry 1 ten to tens column and add it to 2 tens.

147
+128
275

Think, "3 tens and 4 tens are 7 tens." Write 7 in tens place.

Think, "1 hundred and 1 hundred are 2 hundreds." Write 2 in hundreds place. The sum is 275. Bill has 275 stamps all together.

Add up. **Check each answer by adding down:** Stress.

2.	419 218 637	637 136 773	169 116 285	206 244 450	554 218 772	259 624 883
3.	735 245 980	406 115 521	227 129 356	317 546 863	429 553 982	224 317 541
4.	357 207 564	427 538 965	818 165 983	125 418 543	334 336 670	105 229 334
5.	349 412 761	307 104 411	718 119 837	248 334 582	508 147 655	337 106 443

Have pupils demonstrate with a place-pocket chart or an abacus the changing of 10 ones to 1 ten in the addition. Stress that ones are added to ones, tens to tens, and hundreds to hundreds.

Adding Three-Place Numbers

1. Tom had 125 stamps in his book. Today he bought 135 stamps. How many stamps has Tom now? 260

2. In the Lake School there are 228 children. In the Park School there are 269 children. How many children are there in both schools? 497

Add up. Check each answer by adding down: Stress.

3.	669 307 976	412 238 650	459 231 690	715 249 964	839 129 968	654 216 870
4.	608 168 776	526 138 664	568 322 890	258 137 395	223 718 941	309 325 634
5.	336 136 472	127 464 591	545 306 851	309 574 883	361 429 790	145 228 373
6.	102 759 861	233 718 951	425 557 982	549 138 687	118 813 931	427 423 850

7. Find the sum of 704 and 239; 943 of 127 and 536. 663

8. What is the answer when you add 429 to 553? 982

9. Add 229 to each of these numbers: 318 547 146 375 437 666

10. Add two hundred fifteen and six hundred eight. 823

11. Add three hundred nineteen and one hundred two. 421

Find these sums and check:

12. 108 + 556 664 681 + 109 790 227 + 547 774

13. 269 + 209 478 125 + 325 450 626 + 27 653

14. 316 + 179 495 48 + 103 151 414 + 358 772

Let very advanced pupils attempt ex. 7-14 mentally. Pupils who have difficulties should use place-pocket chart to demonstrate sums and exchange.

1. Jack spent 15¢ for paper, 39¢ for a book, and 35¢ for a ticket to the movies. How much money did Jack spend all together? 89¢

2. Jack had a half dollar, a quarter, a dime, and a nickel. Did he have enough money to pay for the things he bought in ex. 1? 90¢; yes

3. Betty wants to practice her music lesson 45 minutes today. So far she has practiced 30 minutes. How many more minutes should Betty practice? 15

4. Peter saves box tops. He had saved 25 tops. Then Aunt Mary gave him 18 tops. Now how many box tops has Peter? 43

5. In Ann's school there are 218 boys and 225 girls. How many children in all are there in the school? 443

6. Bob has 375 stamps in his stamp book. There are 320 stamps of this country. All the rest are from other countries. How many stamps from other countries has Bob in his book? 55

7. Bob has 375 stamps. Joe has a new stamp book and has started to save stamps. He has only 125 now. How many more stamps has Bob than Joe? 250

8. Peggy has 2 quarters. Is that enough to buy a movie ticket for 35¢? Yes If so, how much will be left? 15¢

9. Tom had 50¢ to spend. When he came from the store he had 11¢ left. How much had Tom spent? 39¢

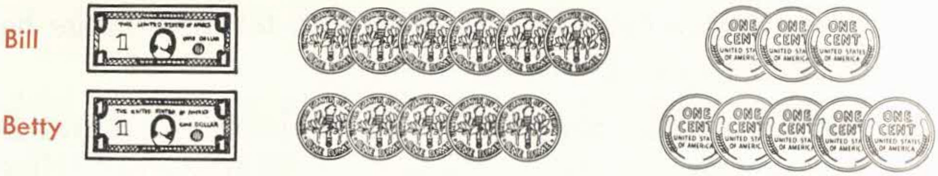
10. Today is Susan's birthday. She got two story books. One book has 128 pages and the other has 144 pages. How many pages are there in both books? 272

Remind pupils to read problems carefully, keeping certain questions in mind: what does the problem ask, what facts are known, what process must be used, how should problem be written in numbers.

Introduce the addition of money involving the changing of 10 dimes to 1 dollar.

Changing Dimes to Dollars

1. Bill and Betty have been saving money for a present for their mother. Now they are putting it together to see how much they have. Here is the money each one has:



Together they have 2 dollars, 11 dimes, 8 pennies. Bill says, "The 11 dimes make 1 dollar and 1 dime. We have 3 dollars, 1 dime, 8 pennies, or \$3.18."

You can write the work as shown at the right. Think, "5¢ + 3¢ = 8¢." Write 8 in pennies place.

\$1.63
+1.55
\$3.18

Think, "5 dimes + 6 dimes = 11 dimes. 11 dimes = 1 dollar and 1 dime." Write 1 in dimes place. Carry 1 dollar to dollars column and add it to 1 dollar.

Think, "\$2 + \$1 + \$3." Write 3 in dollars place. Write the dollar sign. Put the decimal point in the sum under the other decimal points. The answer is \$3.18. Check the work by adding down.

Add these numbers and check each answer:

2.	\$3.65	\$7.51	\$1.95	\$2.94	\$3.55	\$2.73
	5.83	1.68	4.90	1.75	4.51	6.83
	\$9.48	\$8.19	\$6.85	\$4.69	\$8.06	\$9.56
3.	\$4.90	\$1.82	\$1.72	\$1.80	\$1.55	\$2.66
	1.89	6.74	5.76	1.62	3.82	4.72
	\$6.79	\$8.56	\$7.48	\$3.42	\$5.37	\$7.38

More Practice. See ㉘ on page 322.

Demonstrate ex. 1 explanation on large money display chart. Let pupils use play money to show exchange in first few problems. Be sure pupils add immediately the carried dollar. Check process by having pupils add orally.

Carrying from Tens to Hundreds

1. **Problem** Last summer Ann's father took her on a trip. They rode 380 miles by train and 155 miles by car. How many miles did they ride in all? 535

Explanation Think, "5 ones + 0 ones = 5 ones." Write 5 in ones place.

$$\begin{array}{r}380\\+155\\\hline 535\end{array}$$

Think, "5 tens + 8 tens = 13 tens. 13 tens = 1 hundred and 3 tens." Write 3 in tens place. Carry 1 hundred to hundreds column and add it to 1 hundred.

Think, "2 hundreds + 3 hundreds = 5 hundreds." Write 5 in hundreds place. The sum is 535. How many miles did they ride in all? 535

2. Ann's father drove his car 372 miles on Monday and 255 miles on Tuesday. How many miles did he drive both days? 627

Add these numbers and check each answer:

3.	191 253 444	392 461 853	163 643 806	223 286 509	684 223 907	573 254 827
4.	684 95 779	468 161 629	541 374 915	232 595 827	496 323 819	341 195 536
5.	571 196 767	712 97 809	257 370 627	460 296 756	630 185 815	453 91 544
6.	270 164 434	781 182 963	341 168 509	135 74 209	490 343 833	342 383 725

Show with place-pocket chart or abacus the change of 10 tens to 1 hundred. Write numbers on the board for pupils to simplify:
3 hundreds + 16 tens + 5 ones = ____ hundreds + ____ tens + 5 ones.

Reinforce carrying from tens to hundreds place.

Problems and Practice

1. What is the sum of 252 and 356? 608
2. Find the sum of 284 eggs and 155 eggs. 439
3. How many books are 173 books and 162 books? 335
4. Add 391 tickets and 595 tickets. 986

Add these numbers and check each answer:

5. 795 + 112 907 294 + 572 866 160 + 158 318

6. 383 + 472 855 256 + 380 636 136 + 72 208

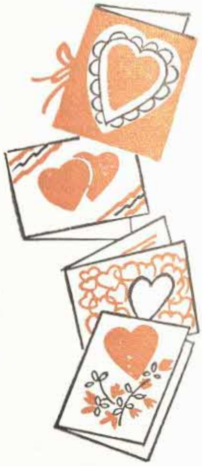
7. 653 + 82 735 493 + 434 927 588 + 240 828

8. 392 + 492 884 187 + 172 359 90 + 236 326

9. Last week Jack helped his father in the store. He stamped prices on 432 cans of corn and 192 cans of milk. How many cans was that all together? 624

10. Jim got two story books for his birthday. One book has 160 pages. The other one has 144 pages. How many pages are there in both books? 304

11. Mr. Green sells valentines. The first week in February he sold 472. The second week he sold 434. How many valentines did he sell in two weeks? 906



Find the sums and check your work:

12.	763 156 919	480 360 840	218 566 784	273 233 506	436 307 743
13.	648 203 851	469 115 584	265 253 518	494 191 685	283 326 609

Again, let pupils use pocket chart to explain sums. If horizontal form causes difficulty, have pupils write problem in vertical form. Be sure pupils check work.

Introduce Roman numerals. Develop their meaning and the method of reading and writing them.

Roman Numerals

1. Jim has many old coins he has saved. One of his old nickels has a V on one side of it, like the nickel shown at the right. Jim's father told him that V is a Roman numeral meaning 5.

2. A long time ago, the Roman people used letters in writing numbers. With only a few different letters the Romans could write all the numbers they needed. The letters stand for numbers and are called **Roman numerals.** Only the letters, **I, V,** and **X,** are needed to write from 1 to 12. I stands for 1, V stands for 5, and X stands for 10.

3. Study how the numbers from 1 to 12 are written below with Roman numerals. Then write them on paper several times until you know them.

I	II	III	IIII or IV	V	VI
1	2	3	4	5	6
VII	VIII	IX	X	XI	XII
7	8	9	10	11	12

4. When I is written before V or X, it means that 1 is subtracted from that numeral. IX means 1 from 10, or 9. What does IV mean? 5 − 1, or 4

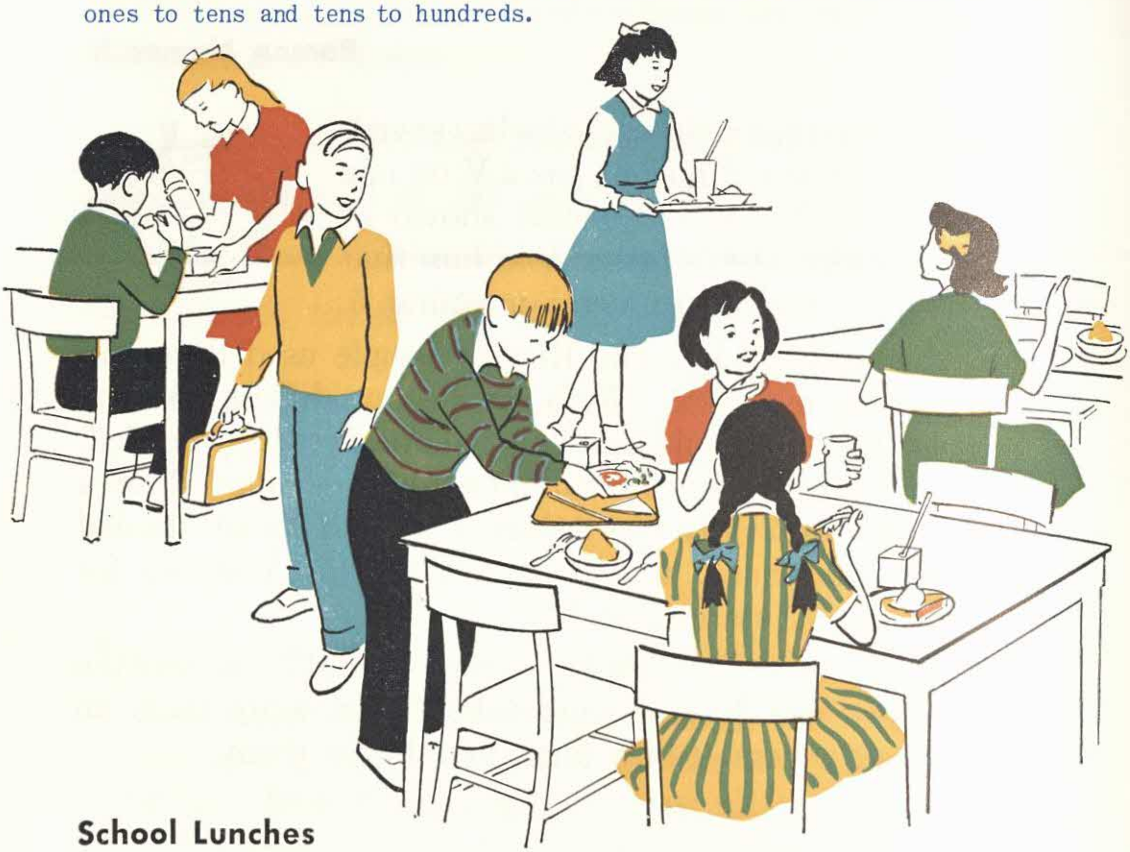
5. When I, II, or III is written after V or X, you add. VII means 5 + 2, or 7. What does XI mean? 10 + 1, or 11 VI? 5 + 1, or 6 XII? 10 + 2, or 12

6. Write with Roman numerals: 4, 8, 11, 7, 9. IV VIII XI VII IX

7. Read these numbers: III, X, VII, XII, IV, IX. 3 10 7 12 4 9

Encourage pupils to investigate uses of Roman numerals today and report findings to class. Give help in translating the numbers. Urge brighter students to discover Roman numerals to 39.

Introduce the addition of two 3-place numbers involving changing of ones to tens and tens to hundreds.



School Lunches

1. **Problem** Today 195 boys and 218 girls ate lunch at school. How many children ate lunch at school? 413

Explanation Write 218 under 195 and add.

$$\begin{array}{r}195\\+218\\\hline 413\end{array}$$

Think, "8 ones + 5 ones = 13 ones, or 1 ten and 3 ones." Write 3 in ones place. Carry 1 ten to tens column and add it to 1 ten.

Think, "2 tens + 9 tens = 11 tens, or 1 hundred and 1 ten." Write 1 in tens place. Carry 1 hundred to hundreds column and add it to 2 hundreds.

Think, "3 hundreds + 1 hundred = 4 hundreds." Write 4 in hundreds place.

How many children ate lunch at school? 413 Check the work by adding down.

Use place-pocket chart and bundles of sticks to demonstrate ex. 1. Be sure pupils understand that 1 ten and not just 1 is carried to the tens column and similarly that 1 hundred and not just 1 is carried to the hundreds column.

Add these numbers and check your work: Stress checking.

1.	183 259 442	687 227 914	424 289 713	236 676 912	149 153 302	281 479 760
2.	577 286 863	359 478 837	196 549 745	715 187 902	296 575 871	349 485 834
3.	387 385 772	149 576 725	573 377 950	288 265 553	196 358 554	449 467 916

4. Ann saves buttons. She has 245 large buttons and 178 small ones. How many buttons has she in all? 423

5. Joe saves stamps. He has 463 stamps of this country and 168 stamps of other countries. How many stamps has Joe all together? 631

6. Mary Ann saves shells. She had 278 shells in June. Then she got 325 shells in the summer. How many shells has Mary Ann now? 603

7. Find the sum of four hundred ninety-two and two hundred eighteen. 710 Add 496 and 208. 704

8. Add three hundred fifty-six and one hundred fifty-four. 510 Add 297 and 657; 954 add 264 and 386. 650

Copy these numbers, add, and check: Stress checking.

9.	497 + 169 666	25 + 375 400	378 + 522 900
10.	65 + 736 801	588 + 337 925	277 + 34 311
11.	259 + 564 823	156 + 48 204	159 + 689 848

More Practice. See ㉙ on page 323.

Have pupils add orally, explaining how and why they are carrying. Let them use pocket chart, if necessary, if they have difficulty.

Extend double-carrying skill to column addition with 3-figure numbers and 3 addends (pages 172-173).

Adding Money

1. **Problem** Jane is saving money to buy Christmas presents. She saved $1.94 one week, $.89 the next week, and $2.25 the third week. How much money did Jane save in three weeks? $5.08

Explanation Write the numbers so that the decimal points are under one another. Write the sign $ only before the first number.

$1.94
.89
2.25
$5.08

Add the cents: 5¢ + 9¢ + 4¢ = 18¢. 18¢ = 1 dime and 8 pennies. Write 8 in pennies place. Carry 1 dime to dimes column and add it to 2 dimes.

Add the dimes: 3 + 8 + 9 = 20. 20 dimes = 2 dollars and 0 dimes. Write 0 in dimes place. Carry 2 dollars to dollars column and add it to 2 dollars. Tell how to finish the work. Add the dollars: 4+1=5, write 5 in dollars place.

2. Find the sum of $1.49, $3.98, and $1.75. $7.22

Add up. Check your answers by adding down: Stress.

3.	$5.25	$2.97	$4.98	$3.08	$3.84
	3.95	1.45	2.39	4.95	2.57
	$9.20	$4.42	$7.37	$8.03	$6.41
4.	$3.29	$7.96	$2.28	$2.91	$7.08
	.91	.34	3.17	.69	1.26
	5.07	1.54	3.45	.66	.94
	$9.27	$9.84	$8.90	$4.26	$9.28
5.	$5.89	$1.96	$4.30	$2.04	$5.30
	.73	.35	2.19	6.58	.57
	2.67	.70	1.78	.48	2.58
	$9.29	$3.01	$8.27	$9.10	$8.45

Copy in columns, add, and check:

6. $1.81 + $1.08 + $.36 $3.25 $6.57 + $.80 + $.24 $7.61

7. $4.55 + $.48 + $4.72 $9.75 $1.77 + $.84 + $.09 $2.70

Have pupils explain their work. Stress adding cents to cents, dimes to dimes, dollars to dollars. Be sure they add immediately the number carried. Stress nature of decimal point (separates dollars from cents).

Taking a Trip

1. Mother took Bill and Sally to see Grandfather White. She paid $9.94 for train tickets. They came home by bus. The bus tickets cost $8.89. How much did all the tickets cost? $18.83

2. On the train Mother paid $1.25 for Bill's lunch, $1.35 for Sally's lunch, and $.95 for her own lunch. How much did the three lunches cost? $3.55

3. Bill had saved $4.75 for the trip. Sally had saved $5.35. How much had the two children saved all together? $10.10

Add these money numbers:

4.	$1.52 1.75 $3.27	$5.18 2.39 $7.57	$4.46 1.79 $6.25	$2.07 2.93 $5.00	$1.34 .97 $2.31
5.	$6.72 2.59 $9.31	$3.85 7.59 $11.44	$4.37 .88 $5.25	$2.68 5.62 $8.30	$6.86 4.76 $11.62

See suggestions for page 172.

Review subtraction with and without changing and addition with double carrying.

Do You Need More Practice?

Subtract. Check your answers by adding: Stress.

1.	47	31	86	89	598	136	882
	15	16	78	64	227	65	412
	32	15	8	25	371	71	470
2.	96	43	35	92	497	105	579
	27	18	32	49	452	41	469
	69	25	3	43	45	64	110
3.	69	44	67	46	879	156	753
	28	25	59	33	813	96	432
	41	19	8	13	66	60	321
4.	82	98	65	51	986	149	107
	44	39	38	28	654	87	53
	38	59	27	23	332	62	54

5. Peter had 90 marbles. He gave some of them to his brother. Now Peter has 75 marbles. How many marbles did Peter give his brother? 15

6. At the store Sally spent 22¢, 15¢, and 49¢. How many cents in all did Sally spend? 86¢

7. Find the sum of $3.98 and $2.75. $6.73

Add these numbers and check your work:

8.	249	126	275	188	563	437
	487	165	58	264	195	265
	736	291	333	452	758	702
9.	276	263	239	436	674	537
	173	278	359	486	235	446
	449	541	598	922	909	983
10.	128	199	326	427	149	744
	755	435	357	238	376	173
	883	634	683	665	525	917
11.	112	174	485	381	358	655
	88	586	879	168	359	237
	200	760	1364	549	717	892

Use this page to spot-check for weaknesses. Determine whether lack of mastery of basic facts or lack of understanding of operations is the source of difficulty. Group pupils for necessary reteaching.

Explain use of zero as place holder in adding dollars and cents.

Watch the Zeros

1. **Problem** Jack bought a cowboy hat for \$2.06 and a cowboy suit for \$7.04. How much did he pay for both of these things? \$9.10

Explanation First think, "4¢ + 6¢ = 10¢." Write 0 in cents place and carry 1 dime to dimes column.

\$2.06
+7.04
\$9.10

Think, "1 dime (carried) + 0 + 0 = 1 dime." Write 1 in dimes place.

Think, "\$7 + \$2 = \$9." Write 9 in dollars place. The answer is \$9.10. How much did Jack pay for the hat and suit? \$9.10

Add and check. Watch the zeros:

2.	\$3.05 5.05 \$8.10	\$4.71 4.09 \$8.80	\$2.78 3.70 \$6.48	\$3.00 2.07 \$5.07	\$.66 .38 \$1.04
3.	\$6.50 1.50 \$8.00	\$1.09 2.96 \$4.05	\$7.08 2.06 \$9.14	\$1.46 5.54 \$7.00	\$.70 .30 \$1.00
4.	\$3.52 5.49 \$9.01	\$2.44 1.99 \$4.43	\$1.97 1.08 \$3.05	\$4.75 4.25 \$9.00	\$.65 .09 \$ .74
5.	\$2.90 4.67 \$7.57	\$2.09 6.09 \$8.18	\$2.55 2.53 \$5.08	\$5.53 1.97 \$7.50	\$.60 .60 \$1.20
6.	\$2.54 6.53 \$9.07	\$4.00 2.90 \$6.90	\$1.28 3.81 \$5.09	\$ .54 3.06 \$3.60	\$.32 .98 \$1.30
7.	\$1.08 4.92 \$6.00	\$5.20 3.80 \$9.00	\$6.00 3.60 \$9.60	\$3.94 6.06 \$10.00	\$.80 .24 \$1.04

Stress adding cents to cents, dimes to dimes, dollars to dollars. Explain that zero must be used to show that there are no dimes or cents.

Pint and Quart

1. Jim and Sally are learning about **pints** and **quarts.** Mother let them use milk bottles and her measuring cups. Jim filled a pint bottle with water. Then he poured water from the pint bottle to fill 1 measuring cup. He used the rest of the pint to fill the other cup. How many cups make 1 pint? 2

2. Sally filled a pint bottle with water. She poured the water into a quart bottle. Then she poured another pint of water into the quart bottle. This just filled the quart bottle. How many pints make 1 quart? 2

Emphasize.

2 cups = 1 pint
2 pints = 1 quart

3. Jim says his glass holds as much as a measuring cup. Will 1 pint of milk fill 2 glasses like Jim's? Yes How many glasses like Jim's will 1 quart of milk fill? 4

4. Jim and Sally each drink 4 glasses of milk a day. How many glasses of milk do you drink every day? Is it more or less than 1 quart?

Carry out experiments in ex. 2–3 to show that 2 pints make 1 quart. 2 glasses (standard size) or 2 cups (standard measuring cups) equal 1 pint. Write table of measures as pupils discover equivalences. Give practice in estimating measures.

Teach how to add numbers representing cents when sum is 100¢ or more.

Money Problems

1. **Problem** This week Bob earned 60¢, 25¢, and 75¢. How much did he earn all together? $1.60

$$\begin{array}{r} 60 \\ 25 \\ \underline{75} \\ 160 \end{array}$$

Explanation The answer to this problem is 160¢. You know that 100¢ make 1 dollar. Then 160¢ is the same as 1 dollar and 60 cents. You write it like this: $1.60.

2. The children are earning money to buy a birthday present for Father. Jim has earned 75¢, Ann has earned 45¢, and Billy has earned 35¢. How much have the children earned all together? $1.55

3. In the last three weeks Susan has saved 80¢, 50¢, and 95¢. How much has Susan saved in this time? $2.25

4. After school Jack sold Christmas cards to three people. He got 65¢, 40¢, and 78¢. How much money did Jack get all together? $1.83

5. Mary went to the store for her mother. She spent 65¢ for eggs, 21¢ for bread, and 22¢ for milk. How much in all did she spend? $1.08

Find the sums. Then write the answers with the sign $:

6.	75¢	47¢	56¢	94¢	48¢	67¢	32¢
	35¢	65¢	54¢	55¢	64¢	26¢	86¢
	75¢	44¢	19¢	28¢	33¢	56¢	42¢
	$1.85	$1.56	$1.29	$1.77	$1.45	$1.49	$1.60

More Practice. See ㉚ on page 323.

Emphasize.

When an answer is larger than 100¢, change the answer to dollars and cents.

Point out to pupils reasonableness of changing cents to dollars and cents. Emphasize relationship of boxed principle to place value ($1.00 is 100¢ and therefore the 1 is in hundreds place).

Making Change

1. **Problem** The children went to a big store. Each one had a quarter. Jim bought a toy truck for 10¢. He gave the girl a quarter. The girl gave back some money to Jim. This money she gave back is called **change.** Can you tell how much change Jim got? 15¢

   Explanation The girl made the change like this: She began with the cost of the toy, 10. She gave Jim a dime, which she added to 10, and said "20." Then she gave Jim a nickel, which she added to 20, and said "25." She stopped there because 25¢ equals the money Jim gave her. She added enough to 10¢ to make 25¢.

2. Susan picked out a doll's hat for 18¢. She gave a quarter to pay for it. Tell what the girl said as she gave Susan the change. 18, 19, 20, 25 How much was the change? 7¢

3. Billy bought a duck for 5¢. He gave the girl a quarter. Tell how she counted the change as she gave it to Billy. 5, 15, 25 How much change did she give Billy? 20¢

Stress additive nature of making change. Do not have pupils set down problem and subtract. Change making is a mental operation. Have pupils use play money to count out change, beginning with cost of article.

5, 10, 15, 25; or 5, 10, 15, 20, 25

4. In ex. 3, Billy got 2 dimes in change. Tell two other ways the change could have been made. Count out Billy's change in these two other ways. Which of the three ways uses the fewest coins? Using two dimes

5. Jane went to the school store with 2 dimes. She bought paper for 13¢. Tell what the man said as he gave her the change. 13, 14, 15, 20 How much money did he give Jane? 7¢ How many coins did he give Jane? 3

6. Make change from 25¢ for things that cost:

17¢ 9¢ 4¢ 15¢ 2¢ 11¢ 14¢

7. Make change from 2 dimes for things that cost:

15¢ 17¢ 12¢ 18¢ 11¢ 14¢ 16¢

8. Play store with toy money and make change for a quarter. Count the change as they do in a store.

Creating a play store in the classroom, as suggested in ex. 8, would be a valuable learning experience for the pupils. Consult the Guide for a discussion of how to do this. Provide opportunities to make change in classroom activities.

Making Change

1. Joe earned a half dollar. He paid 29¢ for a toy boat. The man gave him 1 penny and 2 dimes. • The man gave Joe these coins, one at a time, saying, "29, 30, 40, 50." Why did he begin with 29? Why did he stop at 50? Joe gave the man 50¢. The boat cost 29¢.

2. The man in ex. 1 could have made the change in another way. He could have given Joe 1 penny, 1 dime, and 2 nickels. Then he would have said, as he gave Joe the coins one at a time, "29, 30, 40, . . ., . . ." What numbers go in the spaces? 45, 50 Tell another way the man could have made the change. 1 penny, 4 nickels

3. Suppose you buy a game for 23¢. How would you count your change from 50¢? 23 (or 23, 24), 25, 50 How much change would you get? 27¢ How would you count your change from 50¢ if you buy marbles for 19¢? 19, 20, 25, 50 if you buy a toy for 36¢? 36 (or 36, 37, 38, 39), 40, 50 if you buy ice cream for 8¢? 8 (or 8, 9) 10, 15, 25, 50

4. In making change, the man uses the smallest number of coins he can. Suppose you give him a half dollar for a book that costs a quarter. What is the smallest number of coins he can give you in change? 1 quarter

In these exercises count the change from $1.00. Suppose people buy things that cost these prices: See Guide for answers to ex. 9-20.

5. 24¢ 24, 25, 50, $1.00
6. 72¢ 72 (or 72, 73, 74), 75, $1.00
7. 63¢ 63 (or 63, 64), 65, 75, $1.00
8. 88¢ 88 (or 88, 89), 90, $1.00
9. 19¢
10. 27¢
11. 55¢
12. 75¢
13. 36¢
14. 81¢
15. 47¢
16. 92¢
17. 25¢
18. 60¢
19. 40¢
20. 50¢

21. Do ex. 9 to 12 again. Count the change a different way from the way you used the first time.

Be sure pupils begin with cost of article when counting change. Stress fact that smallest number of coins usually are used in making change.

Introduce the subtraction of amounts of money involving the changing of a dime to pennies or cents.

Changing a Dime

1. **Problem** Dick has saved \$6.48. He wants to buy skates for \$9.75. How much more does he need?

Explanation You cannot subtract 8¢ from 5¢, so you take one of the 7 dimes and change it to 10¢. The 10¢ added to 5¢ makes 15¢. \$9.75 equals 9 dollars, 6 dimes, 15 cents. You can now subtract in this way:

$$\begin{array}{r}\$9.75\\ -6.48\\ \hline\end{array}$$

\$9.75 =	9 dollars	6 dimes	15 cents	
6.48 =	6 dollars	4 dimes	8 cents	
	3 dollars	2 dimes	7 cents,	or \$3.27

A shorter way to do the work is shown below.

You cannot take 8¢ from 5¢, so change one of the 7 dimes to 10¢. 10¢ + 5¢ = 15¢. You can now subtract 8¢ from 15¢. Think, "8¢ from 15¢, 7¢." Write 7 in cents place.

$$\begin{array}{r}\overset{6}{}\ \overset{15}{}\\ \$9.\cancel{7}\cancel{5}\\ -6.48\\ \hline \$3.27\end{array}$$

You changed 1 dime to 10¢, so there are only 6 dimes left. Think, "4 dimes from 6 dimes, 2 dimes." Write 2 in dimes place. Think, "6 dollars from 9 dollars, 3 dollars." Write 3 in dollars place.

Dick needs to save \$3.27 more. Check the work.

Subtract. Tell what you think as you do each step:

2.	\$5.83 3.48 \$2.35	\$8.71 7.03 \$1.68	\$2.82 1.58 \$1.24	\$9.78 1.39 \$8.39	\$2.62 .49 \$2.13
3.	\$3.33 1.24 \$2.09	\$3.97 .28 \$3.69	\$4.50 3.24 \$1.26	\$8.93 1.56 \$7.37	\$6.96 5.48 \$1.48

More Practice. See ㉛ on page 323.

To the Teacher. See page 329 for the additive method of subtraction.

Stress how 1 dime is changed to 10 pennies or cents. Have pupils write sentences such as 9 dollars + 7 dimes + 5 cents = 9 dollars + 6 dimes + 15 cents. Encourage rapid learners to avoid using helping numbers if they can get along without them.

Review the changing of 1 ten to 10 ones in subtraction.

Changing a Ten

1. Problem There are 683 children in our school. In the Lake School there are 549 children. How many more are there in our school than in the Lake School? 134

Explanation You cannot subtract 9 ones from 3 ones. So you take 1 ten from 8 tens and change it to 10 ones. You now have 7 tens and 13 ones.

$$\begin{array}{r} {\scriptstyle 7\ 13} \\ 6\cancel{8}\cancel{3} \\ -549 \\ \hline 134 \end{array}$$

Think, "9 ones from 13 ones, 4 ones." Write 4 in ones place. Think, "4 tens from 7 tens, 3 tens." Write 3 in tens place. Think, "5 hundreds from 6 hundreds, 1 hundred." Write 1 in hundreds place. The answer is 134. There are 134 more children in our school than in the Lake School.

When you have practiced more subtraction, **think** of the little numbers but do not write them. Write the example as shown here.

$$\begin{array}{r} 683 \\ -549 \\ \hline 134 \end{array}$$

Subtract these numbers. Check your work by adding up:

2.	270	986	350	473	561	992
	105	479	226	34	426	754
	165	507	124	439	135	238
3.	994	582	491	395	976	363
	217	566	148	28	557	317
	777	16	343	367	419	46

Copy, subtract, and check:

4. 674 − 425 249   834 − 608 226   392 − 85 307

5. 773 − 269 504   690 − 137 553   994 − 76 918

6. 583 − 355 228   235 − 127 108   785 − 49 736

7. 581 − 419 162   487 − 339 148   590 − 83 507

To the Teacher. See page 329 for the additive method of subtraction.

If needed, demonstrate how 1 ten is changed to 10 ones, using a place-pocket chart or abacus. Following the explanation of ex. 1, have pupils discuss other examples in similar manner. Allow slower pupils to use helping figures if they need them.

Present completion test reviewing money and some special terms.

Do You Know the Right Word?

Tell the right word that goes in each space. On your paper try to write the word:

1. There are 2 pints in 1 . . . quart.
2. Five nickels are equal to a . . . quarter.
3. The tenth month of the year is . . . October.
4. Christmas comes in the month of . . . December.
5. The number 409 means 4 . . . hundreds 0 . . . tens 9 . . . ones.
6. 5 + 2 and 2 + 5 both have the same . . . sum.
7. You read $2.50 like this: 2 . . . dollars and 50 . . . cents.
8. The sign $ means . . . dollar(s); the sign ¢ means . . . cent(s).
9. From half past three to half past four is one . . . hour.
10. To answer questions like **how many are left,** you . . . subtract.
11. To answer questions like **how many are gone,** you . . . subtract.
12. **Sum** is the name of the answer to an example in . . . addition.
13. To find the cost of two or more things at different prices, you . . . add.
14. Four coins that all together equal a half dollar are one . . . quarter, one . . . nickel, and two . . . dimes.
15. When a pie is cut into 4 equal pieces, each piece is one . . . fourth of the pie.
16. The money you get back when you give 25¢ to pay for a 15-cent balloon is the . . . change.
17. When a cake is cut into 3 equal pieces, each piece is one . . . third of the cake.

Use this test to spot-check class or individual weaknesses. Provide further review based on pupils' needs. Let other pupils work at arithmetic corner.

Present the subtraction of amounts of money involving the changing of 1 dollar to 10 dimes.

Changing a Dollar

1. Problem Ann earned \$9.75. She bought a large doll for \$5.85. How much did Ann have left? \$3.90

Explanation You can subtract 5¢ from 5¢ but you cannot subtract 8 dimes from 7 dimes. So you take one of the 9 dollars and change it to 10 dimes. 10 dimes + 7 dimes = 17 dimes. \$9.75 equals 8 dollars, 17 dimes, 5 cents. You can now subtract as shown below:

$$\begin{array}{r} \$9.75 \\ -5.85 \\ \hline \end{array}$$

\$9.75 =	8 dollars	17 dimes	5 cents	
5.85 =	5 dollars	8 dimes	5 cents	
	3 dollars	9 dimes	0 cents,	or \$3.90

Here is a shorter way to do the work.

Think, "5¢ from 5¢, 0¢." Write 0 in cents place. You cannot subtract 8 dimes from 7 dimes, so change \$1 to 10 dimes. Then 10 dimes + 7 dimes = 17 dimes. Think, "8 dimes from 17 dimes, 9 dimes." Write 9 in dimes place. You changed \$1 to 10 dimes, so there are only \$8 left. Think, "\$5 from \$8, \$3." Write 3 in dollars place. Ann had \$3.90 left.

$$\begin{array}{r} \$\overset{8}{\cancel{9}}.\overset{17}{\cancel{7}}5 \\ -5.85 \\ \hline \$3.90 \end{array}$$

Subtract. Tell what you think as you do each step: Stress.

2.	\$8.18	\$4.27	\$9.59	\$5.16	\$5.47
	5.81	2.84	2.95	3.61	1.62
	\$2.37	\$1.43	\$6.64	\$1.55	\$3.85
3.	\$9.16	\$6.88	\$6.27	\$7.23	\$8.14
	4.24	3.90	1.33	6.40	6.52
	\$4.92	\$2.98	\$4.94	\$ .83	\$1.62

More Practice. See ㉜ on page 324.

To the Teacher. See page 329 for the additive method of subtraction.

Demonstrate using large display money. Have pupils use own play money to follow ex. 1 explanation. Do few more examples with class, letting them demonstrate with play money why and how they regroup. Then do ex. 2-3 orally.

Develop the subtraction of 3-place numbers involving the changing of 1 hundred to 10 tens.

Changing a Hundred

1. Problem Tom has 458 stamps all together. Jack has 395 stamps. How many fewer stamps has Jack than Tom? 63

Explanation Think, "5 from 8, 3." Write 3 in ones place. You cannot subtract 9 tens from 5 tens. So take 1 hundred from the 4 hundreds and change it to 10 tens. You now have 3 hundreds and 15 tens.

$$\begin{array}{r} {\scriptstyle 3\;15} \\ \cancel{4}\cancel{5}8 \\ -395 \\ \hline 63 \end{array}$$

Think, "9 from 15, 6." Write 6 in tens place. Think, "3 from 3, 0." You do not write 0 because there is no need to do so. The answer is 63. Jack has 63 fewer stamps than Tom.

Subtract these numbers. Write the small numbers if you need to:

2.	579 498 81	315 234 81	404 231 173	589 397 192	818 443 375	433 392 41
3.	758 376 382	549 84 465	709 291 418	647 593 54	908 557 351	760 470 290
4.	522 250 272	625 561 64	857 162 695	749 72 677	818 771 47	639 355 284
5.	279 183 96	708 572 136	333 171 162	429 96 333	608 464 144	957 887 70
6.	868 783 85	509 286 223	679 484 195	638 265 373	705 654 51	746 186 560

To the Teacher. See page 329 for the additive method of subtraction

Demonstrate ex. 1 using a place-pocket chart or abacus. Have pupils demonstrate other examples similarly. Allow slower pupils to use helping numbers if they need them. Stress that pupils check their answers by addition.

Caution pupils to be careful in working with zeros in the minuend and subtrahend. See discussion in Teacher's Guide.

Watching Zeros

1. Study these subtraction examples and their answers:

633	300	612	416	460	307
508	180	8	209	56	250
125	120	604	207	404	57

2. Cover the answers in ex. 1 with a paper. Then try to write the answers on your paper. If you get a wrong answer, try to find why you got it wrong.

3. Tom and his father went on a trip of 300 miles. They rode 170 miles in the morning. How many more miles did they still have to ride? 130

4. Uncle Jim has 400 hens. Father has 340 hens. How many more hens has Uncle Jim than Father? 60

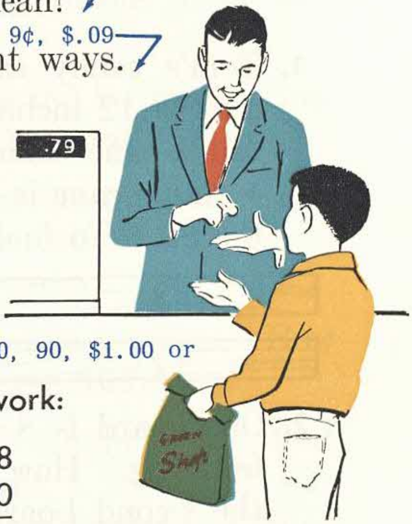
Subtract. Check your work by adding: Stress.

5.	315	542	103	805	800	549
	109	437	73	412	780	469
	206	105	30	393	20	80
6.	408	273	465	211	791	814
	238	66	308	4	386	690
	170	207	157	207	405	124
7.	634	400	243	809	328	500
	328	360	105	550	130	200
	306	40	138	259	198	300
8.	211	310	414	418	403	130
	105	102	107	309	343	69
	106	208	307	109	60	61
9.	906	904	609	163	494	613
	56	714	355	39	405	7
	850	190	254	124	89	606
10.	200	130	900	712	616	600
	130	28	300	409	408	190
	70	102	600	303	208	410

Have pupils, using an abacus or a place-pocket chart, demonstrate how to subtract in ex. 1. Observe pupils closely as they work, to see if they understand what they are doing.

Mixed Practice

1. How much less than 746 is 175? 571
2. How much more than 144 is 404? 260
3. Find the sum and check: 99 + 82 + 44. 225
4. What does the number 8406 mean? 8 thousands, 4 hundreds, 0 tens, 6 ones
5. Write nine cents in two different ways. 9¢, $.09
6. Dick bought a cap for 79¢. He gave the man one dollar. Count the change the man gave Dick. Try to count it in two or three different ways. (1) How much change did Dick get? (2)



(1) 79, 80, 90, $1.00 or 79, 80, 85, 90, $1.00; (2) 21¢

Add these numbers and check your work:

7.	373 125 498	247 216 463	495 294 789	188 520 708		
8.	457 368 825	696 242 938	259 718 977	567 37 604	137 399 536	238 636 874

9. Mary spent 28¢ for cards, 36¢ for stamps, and 75¢ for a book. How much in all did Mary spend? $1.39
10. Mother had 1 pint and 1 quart of milk. How many glasses of milk did this make? 6

Subtract these numbers and check your work:

11.	897 232 665	452 316 136	266 227 39	130 48 82	429 238 191	800 560 240
12.	965 658 307	518 284 234	677 430 247	376 328 48	256 106 150	979 595 384

Observe pupils as they work to note hesitancy or difficulties with new skills. Plan for reteaching, using materials and practice pages.

Extend subtraction concepts to include how much longer, shorter, taller, older, less than. Review linear measures.

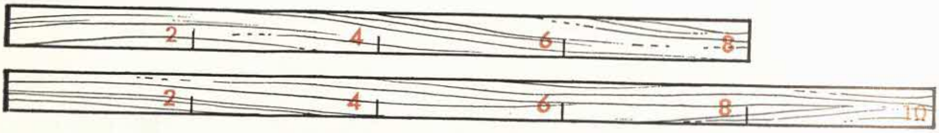
New Problems in Subtraction

Tom's Candy Cane

Ann's Candy Cane

1. Tom's candy cane is 9 inches long. Ann's candy cane is 12 inches long. How many inches longer is Ann's cane than Tom's? 3

▶ Ann's cane is 3 inches longer because 12 is 3 more than 9. To find the answer you subtract 9 from 12.



2. One board is 8 feet long and the other board is 10 feet long. How much shorter is the first board than the second board? 2

▶ The first board is 2 feet shorter than the second board. To find the answer you subtract 8 from 10.

Stress and add to class chart.

To answer questions like how much longer than, how much shorter than, how much taller than, how much older than, how much more than, or how much less than, you subtract.

3. Jane is 15 years old. Her little sister Mary is 8 years old. How many years older is Jane than Mary? 7

4. Jim is 51 inches tall. His father is 72 inches tall. How many inches shorter is Jim than his father? 21

Do problems orally with pupils, pointing out key terms. Have children use new terms in own problems for class to solve.

5. Jim is 51 inches tall. Ann is 43 inches tall. How many inches taller is Jim than Ann? 8

6. Betty is 11 years old. Jane is 15 years old. How many years younger is Betty than Jane? 4

7. Tom made an airplane 14 inches wide. Peter made one 18 inches wide. How many inches wider was Peter's airplane than Tom's? 4

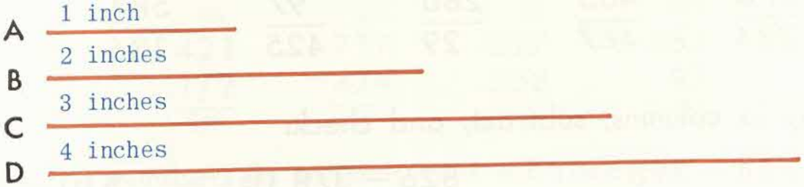
8. Sally has 245 buttons. Alice has 185 buttons. How many fewer buttons has Alice than Sally? 60

9. Dick practiced his music lesson 40 minutes today and 55 minutes yesterday. How many more minutes did he practice yesterday than today? 15

10. Bob has 200 marbles. Jack has 325 marbles. How many more marbles has Jack than Bob? 125

11. Bill and Joe went fishing. Bill caught a fish that was 16 inches long. Joe caught a fish that was 12 inches long. How many inches longer was Bill's fish than Joe's fish? 4

Measure the lines below and then answer the questions in ex. 12–15:



12. How many inches longer is line C than line A? 2

13. How many inches shorter is line B than line D? 2

14. How many inches more is line D than line A? 3

15. How many inches less is line B than line C? 1

Use ex. 12–14 to review the number of inches in a foot.

Introduce changing twice in a single subtraction example; first 1 ten to 10 ones and then 1 hundred to 10 tens.

Changing Twice

1. Problem Billy had 540 stamps. He sold 175 of them. How many stamps did Billy have left? 365

$$\begin{array}{r} \overset{4}{\cancel{5}}\,\overset{13}{\overset{\cancel{3}}{\cancel{4}}}\,\overset{10}{\cancel{0}} \\ -175 \\ \hline 365 \end{array}$$

Explanation You cannot subtract 5 ones from 0 ones, so take 1 ten from 4 tens and change it to 10 ones. Now take 5 ones from 10 ones. Think, "5 from 10, 5." Write 5 in ones place.

You changed 1 ten to 10 ones, so there are only 3 tens left. You cannot subtract 7 tens from 3 tens, so take 1 hundred from 5 hundreds and change it to 10 tens. 10 tens + 3 tens = 13 tens. You can now take 7 tens from 13 tens. Think, "7 from 13, 6." Write 6 in tens place.

You changed 1 hundred to 10 tens, so there are only 4 hundreds left. Think, "1 from 4, 3." Write 3 in hundreds place. Billy had 365 stamps left.

After you have done some examples, **think** of the little numbers but do not write them. Write the example as shown at the right.

$$\begin{array}{r} 540 \\ -175 \\ \hline 365 \end{array}$$

Study these examples. Tell what you think in each step:

2. $\begin{array}{r} 612 \\ 378 \\ \hline 234 \end{array}$ $\quad\begin{array}{r} 932 \\ 465 \\ \hline 467 \end{array}$ $\quad\begin{array}{r} 315 \\ 286 \\ \hline 29 \end{array}$ $\quad\begin{array}{r} 522 \\ 97 \\ \hline 425 \end{array}$ $\quad\begin{array}{r} 720 \\ 584 \\ \hline 136 \end{array}$ $\quad\begin{array}{r} 254 \\ 178 \\ \hline 76 \end{array}$

Copy in columns, subtract, and check:

3. 784 − 398 386   826 − 378 448   510 − 278 232

4. 423 − 136 287   553 − 394 159   675 − 177 498

More Practice. See ㉝ on page 324.

To the Teacher. See page 329 for the additive method of subtraction.

Demonstrate with a place-pocket chart or abacus the meaning of the subtraction in ex. 1. Provide opportunities for pupils to explain other examples in the same manner. Have pupils explain the meaning of the helping figures.

Problems and Practice

1. The children in our school will have a school circus. They have 635 tickets to sell. So far they have sold 278. How many more tickets are there to sell? 357

2. On Wednesday the school busses took 224 children to the airfield. On Thursday they took 198 children there. How many more children went on Wednesday than on Thursday? 26

3. On the two days 422 children went to the airfield. There were 225 girls. How many boys were there? 197

4. Subtract 655 from 942. 287

5. From 814 subtract 347. 467

Subtract these numbers. Check your work: Stress.

6.	542 278 264	841 568 273	352 199 153	931 446 485	665 486 179	556 369 187
7.	861 469 392	313 255 58	879 526 353	733 638 95	954 759 195	781 384 397
8.	392 337 55	421 172 249	777 479 298	627 558 69	365 97 268	773 294 479

Copy the numbers in columns and subtract:

9. 674 − 187 487 514 − 466 48 644 − 395 249

10. 574 − 278 296 267 − 149 118 816 − 179 637

11. 793 − 697 96 309 − 205 104 768 − 618 150

12. 527 − 367 160 525 − 439 86 442 − 368 74

Have pupils work independently. Let those who have difficulty explain their work at board, using pocket chart if necessary.

Provide oral practice in adding by endings and in making change.
Check understanding of place value.

Oral Practice

1. Tell the answers to the addition and subtraction facts on pages 87 and 88. See answers for those pages.

2. Add 5 to each of these numbers:

32 37   47 52   21 26   19 24   53 58   96 101   44 49   75 80   68 73

3. Add 6 to each number in ex. 2. Add 8. Add 9. See Guide.

4. Subtract 10 from each number in ex. 2.(1) Subtract 2.(2)
(1) 22, 37, 11, 9, 43, 86, 34, 65, 58; (2) 30, 45, 19, 17, 51, 94, 42, 73, 66

Tell the answers. Watch the signs:

5. 2 + 5 + 8 15	4 + 4 + 3 11	35 + 7 42
6. 3 + 4 + 5 12	6 + 3 + 8 17	28 − 6 22
7. 1 + 8 + 6 15	7 + 1 + 6 14	19 − 4 5
8. 5 + 4 + 5 14	2 + 4 + 5 11	59 + 6 65
9. 8 + 2 + 5 15	5 + 3 + 2 10	47 − 4 43

10. Count by 10's to 120; by 5's to 75. See Guide.

11. What number means 8 tens? 80 10 tens? 100

12. Do 9 dimes + 6 cents equal 8 dimes + 16 cents? Yes

13. Name the days of the week, beginning with today.

14. Name the day that comes after Friday. Saturday

15. How many nickels are equal to a half dollar? 10

16. Tell the largest number that has 4 figures. 9999

17. Tell the smallest number that has 4 figures. 1000

18. What coins could you get in change from a quarter after spending 12¢? 3 pennies and 1 dime, or 3 pennies and 2 nickels

19. What coins could you get in change from a half dollar after spending 40¢? 1 dime, or 2 nickels

Urge pupils to respond quickly in ex. 1–9. Note any difficulties in basic facts and plan for drill on these. Plan for further review if weaknesses appear in other areas.

Develop carefully how to subtract when there are double zeros in the minuend. Stress that 500 = 50 tens = 49 tens + 10 ones.

Zeros in Subtraction

1. Problem Miss White had 500 sheets of paper in a package. She gave the children 328 sheets of it. How many sheets of paper were left? 172

Explanation Look at A at the right. You cannot take 8 ones from 0 ones. There are no tens, so you cannot change 1 ten to 10 ones. But you can think of 500 as 490 + 10 and write it as shown at B. Then think, "8 from 10, 2." Write 2 in ones place. Think, "2 from 9, 7." Write 7 in tens place. Think, "3 from 4, 1." Write 1 in hundreds place. The answer is 172. There were 172 sheets of paper left. Check the work.

$$\begin{array}{rr} \text{A} & \text{B} \\ & 49\overset{10}{0} \\ 500 & \\ \underline{-328} & \underline{-328} \\ & 172 \end{array}$$

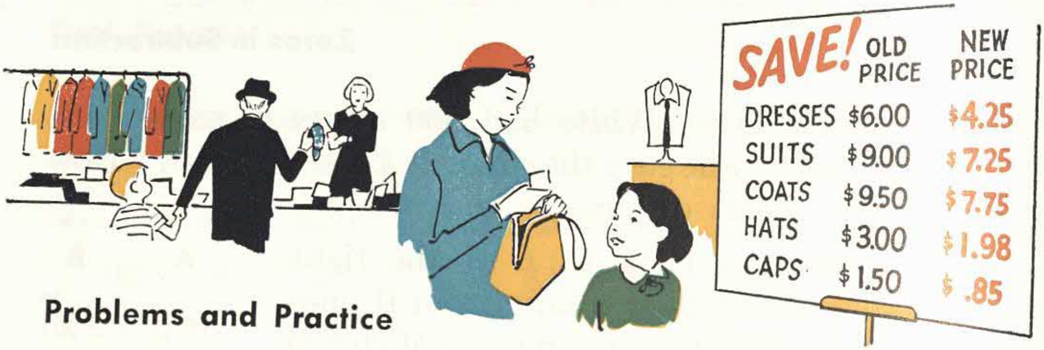
Subtract these numbers and check your work:

2.	600 284 316	500 406 94	940 253 687	570 172 398	200 39 161	490 191 299
3.	300 275 25	802 667 135	766 578 188	700 318 382	182 96 86	600 125 475
4.	800 407 393	300 235 65	900 346 554	404 315 89	602 558 44	550 284 266
5.	411 93 318	600 399 201	707 478 229	500 214 286	300 82 218	615 576 39
6.	500 347 153	300 165 135	800 528 272	400 213 187	905 699 206	625 498 127

More Practice. See ㉞ on page 324. Use to reinforce skill.

To the Teacher. See page 329 for the additive method of subtraction.

Demonstrate ex. 1–2 using a place-pocket chart or abacus. Have pupils complete such sentences as the following: 600 = _____ tens = _____ tens + 10 ones. Stress that ones are subtracted from ones, tens from tens, and so on.



Problems and Practice

1. Look at these old and new prices for children's clothes. How much can Mary save on a dress that used to cost $6.00? $1.75

2. Jack bought a suit for $7.25. It used to cost $9.00. How much money did he save? $1.75

3. The old price of a coat is $9.50. The new price is $7.75. How much can Betty save on a coat? $1.75

4. A girl's hat costs $1.98. A boy's cap costs $.85. How much more does the hat cost than the cap? $1.13

Subtract and check:

5.	692	440	508	624	836	700
	167	297	269	465	438	385
	525	143	239	159	398	315
6.	535	700	312	606	400	944
	468	247	228	299	374	779
	67	453	84	307	26	165
7.	800	434	745	900	823	307
	531	157	667	518	388	159
	269	277	78	382	435	148
8.	406	500	735	621	750	800
	387	196	349	399	469	652
	19	304	386	222	281	148
9.	700	824	807	613	500	745
	123	778	278	585	369	546
	577	46	529	28	131	199

Use play money to demonstrate ex. 1. Have pupils use pocket chart to explain some examples in ex. 5-9.

Apply addition and subtraction skills to examples involving dollars and cents.

Dollars and Cents

1. Jim went to the store for his mother. He spent $2.86, $.78, and $1.65. How much in all did he spend? $5.29

2. Susan had $3.50 in her bank. Then she put in the $5.00 she got for her birthday. Today Susan put $.75 more in her bank. All together, how much has Susan in her bank? $9.25

3. Dick had $1.00 when he went to the movies. The ticket cost $.45. How much change did Dick get? $.55

Add up. Check your work by adding down:

4.	$2.47	$1.59	$4.26	$1.63	$2.57
	1.56	4.68	3.00	.58	1.22
	4.77	2.37	1.89	2.46	4.18
	$8.80	$8.64	$9.15	$4.67	$7.97
5.	$4.99	$7.46	$1.83	$2.00	$8.78
	2.73	.64	5.70	6.07	2.54
	2.33	1.57	1.48	4.96	.54
	$10.05	$9.67	$9.01	$13.03	$11.86

6. Ann saw a sweater she wants. It costs $5.00 but Ann has only $3.77. How much more money does she need if she buys the sweater? $1.23

7. Bill earned $1.75 last week and $2.25 this week. How much less did Bill earn last week than this week? $.50

Subtract. Check your work by adding:

8.	$3.56	$8.50	$8.05	$5.00	$7.15
	1.80	2.95	4.92	3.34	5.39
	$1.76	$5.55	$3.13	$1.66	$1.76
9.	$4.88	$7.00	$4.50	$6.17	$3.00
	4.39	4.57	2.52	3.99	.76
	$ .49	$2.43	$1.98	$2.18	$2.24

Stress addition or subtraction of cents with cents, dimes with dimes, dollars with dollars. Have pupils explain some problems to check understanding of process steps.

Consult the Teacher's Guide for an explanation of how the test items correlate with the aims of the chapter.

Chapter Review

1. Use the sign $ and a decimal point to write each of these money numbers:

4 dollars and fifteen cents $4.15	5 dollars $5.00
7 dollars and fifty cents $7.50	35 cents $.35
1 dollar and eight cents $1.08	70 cents $.70

2. Write twelve cents in three different ways. 12¢, $.12, 12 cents

Three thousand six hundred, or thirty-six hundred

3. Read these numbers in two ways: 3600 9400

Nine thousand four hundred, or ninety-four hundred

4. What does the number 4629 mean?

4 thousands, 6 hundreds, 2 tens, 9 ones

5. Make change from 50¢ for things that cost: See Guide.

31¢ 25¢ 43¢ 17¢ 12¢ 5¢ 8¢

6. How many glasses can you fill with 1 quart of milk? Four with 1 pint of milk? Two

7. Read these numbers: X, IIII, VIII, V, XII. Twelve

Ten Four Eight Five

8. Write in Roman numerals: 9, 3, 7, 11, 4, 6. VI

IX III VII XI IV or IIII

Add these numbers and check:

9.	145	574	226	329	307	162
	679	265	114	491	403	234
	824	839	340	820	710	396
10.	568	235	416	435	126	583
	349	477	428	165	432	172
	917	712	844	600	558	755

Subtract these numbers and check:

11.	826	573	289	376	100	844
	353	557	162	287	76	197
	473	16	127	89	24	647
12.	734	800	779	965	650	341
	651	668	288	486	252	234
	83	132	491	479	398	107

Use test as preparation for diagnostic test. Note errors or hesitancy on progress cards. Plan for reteaching or drill.

A Problem Test

1. Jim is 9 years old. His brother is 15 years old. How many years older than Jim is his brother? 6

2. Last week Susan saved a half dollar, 3 dimes, and 3 nickels. How many cents in all did Susan save? 95¢

3. Jack had $2.00. At the circus he spent all but $.22. How much money did Jack spend? $1.78

4. Peggy gave the man a dollar to pay for a 15-cent ball. Write the coins that the man could have given her in change. How much change did Peggy get? 85¢
   1 dime, 1 quarter, 1 half dollar

5. At the store Bob bought eggs for 65¢, apples for 29¢, and bread for 19¢. How much did Bob spend? $1.13

6. There are 362 children in our school. This week 218 children went to see a big farm. The rest will go next week. How many children will go next week? 144

7. Jane made 36 Christmas cards last week. Alice made 30 cards in the same time. How many more cards did Jane make than Alice? 6

8. Peter has some hens. Last week he got 81 eggs. He gave his mother 15 eggs and sold the rest. How many eggs did Peter sell? 66

9. Mary ate lunch at school. She paid 15¢ for an egg sandwich, 8¢ for milk, 5¢ for an apple, and 2¢ for a cookie. How much did Mary's lunch cost? 30¢

10. Betty and Joe want to spend $3.00 for a birthday present for Mother. They have saved $1.87 so far. How much more do they need to save? $1.13

Count 10 for each problem you have right.

Urge pupils to read problems carefully, to see what they are asked to find. Have pupils explain answers as check of understandings of thought patterns or processes.

Present diagnostic test of skills taught in chapter.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Pages for that row and do the examples on those pages.

Add these numbers and check your work:

						Practice Pages
1.	635	149	245	148	312	162–164
	248	323	416	534	179	
	883	472	661	682	491	
2.	191	362	265	592	183	166–168
	686	353	564	247	376	
	877	715	829	839	559	
3.	285	679	386	438	396	170–172
	479	257	128	475	219	
	764	936	514	913	615	
4.	$2.24	$7.07	$1.98	$5.57		175
	1.76	2.09	1.02	1.48		
	$4.00	$9.16	$3.00	$7.05		

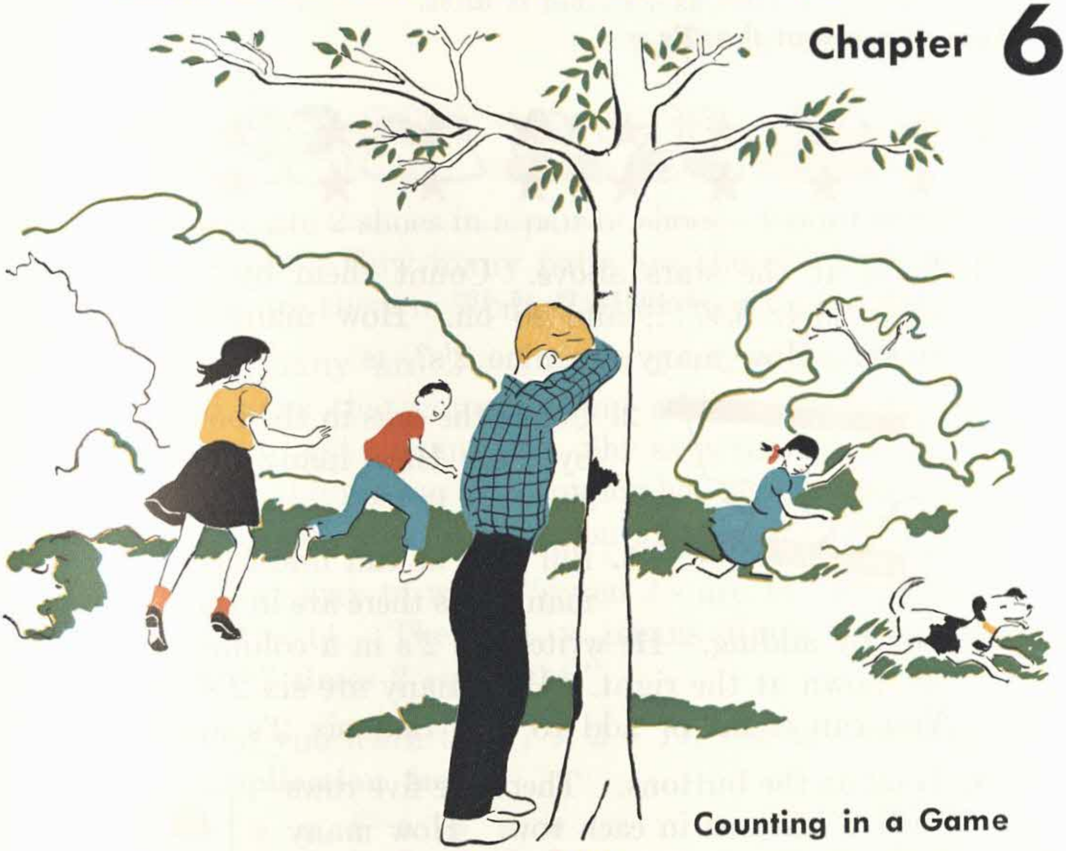
Subtract these numbers and check your work:

5.	392	674	882	768	973	181, 182
	148	216	555	249	337	
	244	458	327	519	636	
6.	876	429	647	314	745	184, 185
	485	292	373	144	451	
	391	137	274	170	294	
7.	293	503	900	415	420	186
	79	330	600	206	370	
	214	173	300	209	50	
8.	981	623	925	533	872	190, 191
	687	256	329	165	693	
	294	367	596	368	179	
9.	500	801	700	900	560	193
	57	726	176	294	295	
	443	75	524	606	265	

Compare results of this test with previous one (page 196) as noted on progress cards. Urge pupils to make self-assignments from practice pages. Reteach skills if necessary.

Consult Teacher's Guide for specific aims of Chapter 6.

Chapter 6



Counting in a Game

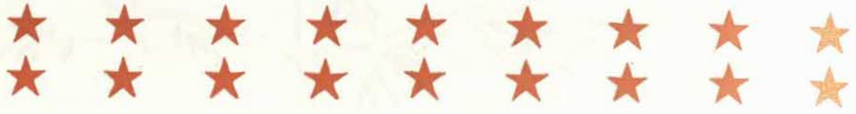
Reteach counting by 2's, 5's, and 10's.

1. The children are playing a game. Bill is counting while the children hide. He counts by 5's to 100. Can you count by 5's to 100? Try it.
2. Betty likes to count by 2's when it is her turn. She counts like this: 2, 4, 6, 8, 10, 12, and so on to 50. Start at 12 and count by 2's to 50. Can you count by 2's to 100?
3. Begin with 24 and count by 2's to 60.
4. Begin with 30 and count by 5's to 85.
5. Begin with 45 and count by 10's to 95.
6. Begin with 70 and count by 2's to 110.

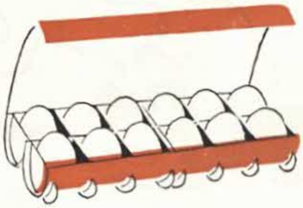
Provide readiness for multiplication by having pupils count things by 2's, 5's, and 10's. Utilize situations where there is a need to count by these numbers. Refer to a number chart like the one on page 30 as the pupils count.

Associate multiplication and addition concepts. Begin construction of a multiplication table as described in Guide.

Learning about the 2's



1. Look at the stars above. Count them by 2's like this: 2, 4, 6, 8, 10, 12, 14, 16, 18 . . ., and so on. How many 2's are there? 9 How many are nine 2's? 18

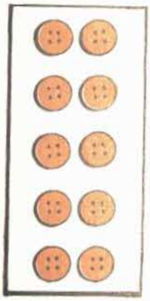


2. Count the eggs in the box by 2's. How many are six 2's? 12

3. Bill says he can find how many eggs there are in the box by adding. He writes the 2's in a column as shown at the right. How many are six 2's? 12 You can count or add to find that six 2's are 12.

$$\begin{array}{r} 2\\ 2\\ 2\\ 2\\ 2\\ 2\\ \hline 12 \end{array}$$

4. Look at the buttons. There are five rows with 2 buttons in each row. How many buttons are there? 10 How many are five 2's? 10 Count or add to find the answer.



5. On your paper draw 4 groups of dots with 2 dots in each group. How many dots did you draw? 8 Count them by 2's. How many are four 2's? 8

Tell the answers. Draw dots if you need help: Have pupils circle the groups of 2.

6. Five 2's are .10. Six 2's are 12 .

7. Nine 2's are 18 . Eight 2's are 16 .

8. Four 2's are .8. . Three 2's are .6. .

9. Two 2's are .4. . Seven 2's are .14 .

Have pupils use such objects as discs or buttons to show arrangements of the groups in ex. 1-4. Urge pupils to discover in various ways how many are in a group. Stress such relationships as, "Since five 2's = 10, then six 2's = 10 + 2, or 12."

Develop the multiplication vocabulary. Add new words to the class arithmetic chart.

The 2's in Multiplication

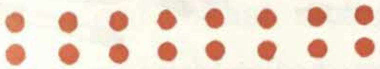
1. There are 2 shoes in a pair of shoes. Count the pairs of shoes. How many pairs are there? 7 How many shoes are there in 7 pairs? 14 How many are seven 2's? 14

2. How many are 2 + 2 + 2 + 2 + 2 + 2 + 2? 14 Miss Hill says that counting and adding are both good ways to get the answer. She says that another way to get the answer is to remember that seven 2's are 14. When you do this, you are **multiplying** 2 by 7.

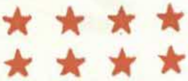
3. A short way to write "seven 2's are 14" is like this: 7 × 2 = 14. The sign × means **times.** You read this "7 **times** 2 **equals** 14."

4. When you learn that 7 × 2 = 14, you are learning a **multiplication fact.**

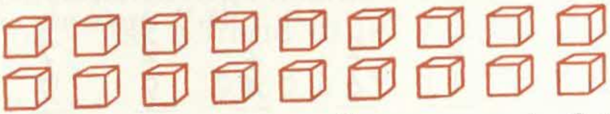
A



B



C



5. Which picture above shows the answer to 9 times 2? C How many are nine 2's? 18 How many are 9 × 2? 18

6. Which picture shows 4 times 2? B How many are four 2's? 8 4 × 2? 8 What multiplication fact does A show? 8 X 2 = 16

Tell the answers: Have pupils show facts by dot drawings also.

7. Nine 2's are .18. . 9 × 2 = 18. . 7 × 2 = . 14.
8. Five 2's are .10. 5 × 2 = 10. . 8 × 2 = . 16.
9. Six 2's are . . 12 6 × 2 = 12 . 3 × 2 = . .6.

Present multiplication as an abbreviated form of addition for those cases where one number is repeated. Have pupils prove some of the multiplication facts by addition. Provide practice in reading and writing multiplication facts.

Introduce the vertical form for writing multiplication facts. Relate the vertical form to the horizontal form.

The 2's in Multiplication

1. Another way to write $5 \times 2 = 10$ is to write 5 under 2, as shown at the right. This is read "5 times 2 equals 10." Another way to say "5 times 2 equals 10" is to say you **multiply** 2 by 5. The answer 10 is called the **product.**

$$\begin{array}{r} 2 \\ \times 5 \\ \hline 10 \end{array}$$

2. Learn these multiplication facts: Make fact cards for drill.

$$\begin{array}{r} 2 \\ \times 1 \\ \hline 2 \end{array} \quad \begin{array}{r} 2 \\ \times 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 2 \\ \times 3 \\ \hline 6 \end{array} \quad \begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array} \quad \begin{array}{r} 2 \\ \times 5 \\ \hline 10 \end{array} \quad \begin{array}{r} 2 \\ \times 6 \\ \hline 12 \end{array} \quad \begin{array}{r} 2 \\ \times 7 \\ \hline 14 \end{array} \quad \begin{array}{r} 2 \\ \times 8 \\ \hline 16 \end{array} \quad \begin{array}{r} 2 \\ \times 9 \\ \hline 18 \end{array}$$

3. Jim buys marbles at 2¢ each. How much does he pay for 4 marbles? 8¢ for 7 marbles? 14¢ for 8 marbles? 16¢

4. Susan buys crayons for 2¢ each. How much must she pay for 3 crayons? 6¢ for 5 crayons? 10¢ for 6 crayons? 12¢

5. Multiply these numbers: Be sure pupils say "eight 2's are 16." Avoid use of "times."

$$\begin{array}{r} 2 \\ 8 \\ \hline 16 \end{array} \quad \begin{array}{r} 2 \\ 5 \\ \hline 10 \end{array} \quad \begin{array}{r} 2 \\ 1 \\ \hline 2 \end{array} \quad \begin{array}{r} 2 \\ 6 \\ \hline 12 \end{array} \quad \begin{array}{r} 2 \\ 4 \\ \hline 8 \end{array} \quad \begin{array}{r} 2 \\ 9 \\ \hline 18 \end{array} \quad \begin{array}{r} 2 \\ 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 2 \\ 7 \\ \hline 14 \end{array} \quad \begin{array}{r} 2 \\ 3 \\ \hline 6 \end{array}$$

6. Here is another way to write the multiplication facts for 2's. Tell the answers:

1 × 2 = . 2 .
2 × 2 = . 4 .
3 × 2 = . 6 .
4 × 2 = . 8 .
5 × 2 = . 10.
6 × 2 = . 12.
7 × 2 = . 14 .
8 × 2 = . 16 .
9 × 2 = . 18.

7. Draw a picture of pennies to show 4 groups with 2 pennies in each group. Write the multiplication fact that shows how many pennies there are. 4 x 2 = 8

Have pupils point out the relationships among the facts in ex. 6. Then ask such questions as, "If you know that eight 2's are 16, how can you find nine 2's in case you forget the answer? seven 2's?" Practice the facts in random order.

Use multiplication facts of 2's in problems.

Problems about 2's

1. Find the cost of 3 dolls at \$2 each. \$6
2. Find the cost of 6 cookies at 2¢ each. 12¢
3. At 2¢ each, how much will 7 stamps cost? 14¢
4. At 2¢ each, how much will 5 pencils cost? 10¢
5. At 2¢ each, how much will 9 lollipops cost? 18¢
6. Mary is making sandwiches. She needs 2 pieces of bread for each one. How many pieces of bread does she need for 8 sandwiches? 16 What is the multiplication fact you use to work this problem? 8 X 2 = 16
7. At the park Jack saw 2 bears in each cage. How many bears did he see in 4 cages? 8 What multiplication fact do you use in this problem? 4 X 2 = 8
8. Mother bought 2 sweaters for the children. She paid \$2 for each sweater. How much did she pay for the 2 sweaters? \$4 What multiplication fact do you use? 2 X 2 = 4
9. Make up a problem to go with each of the multiplication facts below. Ask a friend to tell you the answers.

$6 \times 2 = \ldots$ 12 $\quad 9 \times 2 = \ldots$ 18 $\quad 3 \times 2 = \ldots$ 6

$8 \times 2 = \ldots$ 16 $\quad 5 \times 2 = \ldots$ 10 $\quad 7 \times 2 = \ldots$ 14

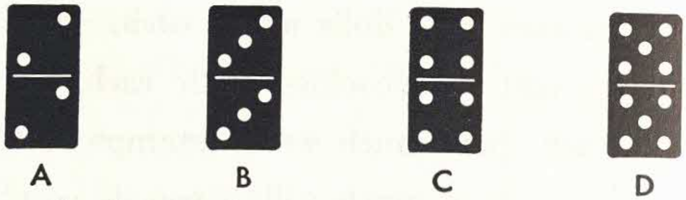
Tell the answers:

10. Five 2's = 10	3 times 2 = 6	6 × 2 = 12
11. Six 2's = 12	9 times 2 = 18	8 × 2 = 16
12. Four 2's = 8	7 times 2 = 14	5 × 2 = 10
13. Two 2's = 4	6 times 2 = 12	7 × 2 = 14
14. Nine 2's = 18	8 times 2 = 16	4 × 2 = 8

Do problems orally with pupils. Be sure they write examples correctly (in ex. 1, 3 is bottom number). Stress that top number tells how many in each group, bottom number tells number of equal groups. Show with drawings.

Show how the addition facts that are doubles are written as multiplication facts and how facts on page 203 are reversed.

9 New Multiplication Facts



1. Picture A above shows two 2's. Picture B shows two 3's. C shows two 4's. What does D show? Two 5's Number pictures like these are called **doubles.** You can write the doubles as addition facts, like this:

$$\begin{array}{r} 1 \\ +1 \\ \hline 2 \end{array} \quad \begin{array}{r} 2 \\ +2 \\ \hline 4 \end{array} \quad \begin{array}{r} 3 \\ +3 \\ \hline 6 \end{array} \quad \begin{array}{r} 4 \\ +4 \\ \hline 8 \end{array} \quad \begin{array}{r} 5 \\ +5 \\ \hline 10 \end{array} \quad \begin{array}{r} 6 \\ +6 \\ \hline 12 \end{array} \quad \begin{array}{r} 7 \\ +7 \\ \hline 14 \end{array} \quad \begin{array}{r} 8 \\ +8 \\ \hline 16 \end{array} \quad \begin{array}{r} 9 \\ +9 \\ \hline 18 \end{array}$$

The first fact shows that two 1's are 2. Another way to write "two 1's are 2" is like this: $2 \times 1 = 2$. The last fact shows that two 9's are 18. You can also write it $2 \times 9 = 18$. You see that you can write each double as an addition fact or as a multiplication fact.

2. Write all the multiplication facts that can be made from the addition facts in ex. 1. 2x1=2, 2x2=4, 2x3=6, 2x4=8, 2x5=10, 2x6=12, 2x7=14, 2x8=16, 2x9=18

Tell the answers to these multiplication facts. If you do not know an answer, look at the addition facts in ex. 1:

3. 2 × 5 = ...10. 2 × 9 = ...18. 2 × 2 = ...4.
4. 2 × 8 = ...16. 2 × 6 = ...12. 2 × 4 = ...8.
5. 2 × 3 = ...6. 2 × 1 = ...2. 2 × 7 = ...14.

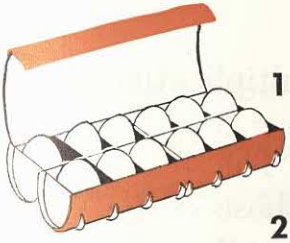
6. Learn these new multiplication facts: Make fact cards.

$$\begin{array}{r} 1 \\ \times 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 2 \\ \times 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array} \quad \begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array} \quad \begin{array}{r} 5 \\ \times 2 \\ \hline 10 \end{array} \quad \begin{array}{r} 6 \\ \times 2 \\ \hline 12 \end{array} \quad \begin{array}{r} 7 \\ \times 2 \\ \hline 14 \end{array} \quad \begin{array}{r} 8 \\ \times 2 \\ \hline 16 \end{array} \quad \begin{array}{r} 9 \\ \times 2 \\ \hline 18 \end{array}$$

Have the pupils illustrate the multiplication facts in ex. 6 by making dot diagrams like those at the top of the page. Stress correct reading of facts in vertical form. The first example in ex. 6 is read as "two 1's" or "2 times 1."

Present multiplication facts of 2's and reverses.

Pairs of Multiplication Facts

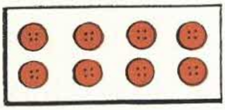


1. Here is an egg box with a dozen eggs in it. How many eggs are there in a dozen? 12

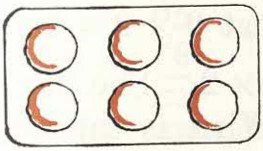
2. You see there are 2 eggs in each row and there are 6 rows of eggs. How many are six 2's? 12

3. Look at the eggs again. There are 6 eggs on one side of the box and 6 along the other side. How many are two 6's? 12

4. The eggs show two multiplication facts: 6 × 2 = 12 and 2 × 6 = 12. These facts make a pair of facts.



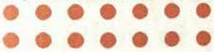
5. How many buttons do you see on the card? 8 What two multiplication facts does the card show? 2 x 4 = 8 and 4 x 2 = 8



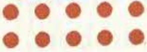
6. How many cupcakes do you see in this pan? 6 Write the two multiplication facts that the picture shows. 2 x 3 = 6 and 3 x 2 = 6

7. Look at the dots below. What pair of multiplication facts goes with each group of dots?

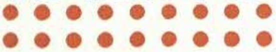
2 x 7 = 14 and 7 x 2 = 14



2 x 5 = 10 and 5 x 2 = 10



2 x 9 = 18 and 9 x 2 = 18



Tell the number that goes in each space: Show in vertical form.

8. 3 × 2 = . 6 ., so 2 × 3 = . 6 . Two 5's are . 10.

9. 9 × 2 = . 18 ., so 2 × 9 = . 18. Four 2's are . 8 .

10. 5 × 2 = . 10 ., so 2 × 5 = . 10. Six 2's are . 12.

11. 7 × 2 = . 14 ., so 2 × 7 = . 14. Two 9's are . 18.

12. 8 × 2 = . 16 ., so 2 × 8 = . 16. Five 2's are . 10.

Let pupils use objects to show equal groups in ex. 1-7 (first show 6 groups of 2's, then 2 groups of 6's). Let them discover that answers are same. Extend work in ex. 8-12 to develop all the 2's in this way.

Lead pupils to generalize that if the order of the numbers in multiplication is reversed, their product remains the same.

What to Do If You Forget

1. On page 205 you learned that multiplication facts come in pairs. 4 × 2 = 8 and 2 × 4 = 8 make a pair of multiplication facts. The numbers in 4 × 2 are the same as those in 2 × 4 but they are reversed. 4 × 2 and 2 × 4 both have the same product, which is 8.

$$\begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array} \qquad \begin{array}{r} 4 \\ \times 2 \\ \hline 8 \end{array}$$

2. You see that 2 × 8 and 8 × 2 also make a pair of multiplication facts. Do these facts both have the same product? Yes

$$\begin{array}{r} 8 \\ \times 2 \\ \hline \end{array} \qquad \begin{array}{r} 2 \\ \times 8 \\ \hline \end{array}$$

3. What fact goes with 2 × 7 to make a pair? 7 x 2 What is the answer to both facts? 14

4. Peter forgets the answer to 9 × 2. He reverses the numbers and gets 2 × 9. Peter remembers that 2 × 9 = 18. This shows him that 9 × 2 = 18.

5. Susan forgets the answer to 6 × 2. She reverses the numbers and gets 2 × 6. What is the answer to 2 × 6? 12 Then what is the answer to 6 × 2? 12

Emphasize.

If you forget the answer to a multiplication fact, reverse the numbers. Then try to multiply them.

What numbers go in the spaces?

6. $3 \times 2 = 2 \times \overset{3}{\ldots}$ $\quad 9 \times 2 = 2 \times \overset{9}{\ldots}$

7. $7 \times 2 = 2 \times \overset{7}{\ldots}$ $\quad 2 \times 4 = 4 \times \overset{2}{\ldots}$

8. $2 \times 1 = 1 \times \overset{2}{\ldots}$ $\quad 8 \times 2 = 2 \times \overset{8}{\ldots}$

Review the principle in addition that changing the order of the addends does not change the sum and point out similarity to the above principle.

Maintain previously taught skills.

Addition and Subtraction

Write the numbers in columns. Then add and check:

1. 29 + 86 + 46 161   64 + 36 + 57 157   49 + 76 + 55 180
2. 72 + 99 + 84 255   46 + 87 + 75 208   69 + 40 + 97 206
3. 78 + 88 + 33 199   59 + 24 + 37 120   73 + 75 + 39 187
4. At the store Jack spent 34¢, 32¢, and 85¢. How much did Jack spend all together? $1.51
5. Susan spent 36¢, 82¢, and 13¢ at the school store. How much in all did Susan spend? $1.31

Add these numbers and check your work:

6. 93	85	721	745	595	442
48	16	246	165	234	286
141	101	967	910	829	728
7. 83	95	467	377	531	698
69	78	334	253	399	263
152	173	801	630	930	961

8. Use the examples in ex. 6–7 as subtraction examples. Subtract and check your work. Ex. 6: 45, 69, 475, 580, 361, 156; ex. 7: 14, 17, 133, 124, 132, 435
9. Last week Jim's father got 382 eggs from his hens. He sold 360 eggs. How many eggs did he have left? 22 Did he have more than or less than 1 dozen left? More

Subtract and check your work:

10. 94	88	698	469	490	283
65	29	564	180	482	185
29	59	134	289	8	98
11. 75	76	954	287	327	362
68	15	466	275	179	283
7	61	488	12	148	79

More Practice. See ㉟ on page 325. Use to reinforce skills.

Urge more advanced pupils to do ex. 1-5 horizontally (mentally if possible). Observe hesitancy and errors. Have pupils explain work to check understanding of processes.

Provide practice in multiplying numbers mentally.

Problems and Practice

1. Betty bought 6 post cards. Each one cost 2¢. How much did she spend for the cards? 12¢
2. Jim wants to save $2 each week. How much will he have at the end of 4 weeks? $8
3. Mother bought 2 dresses for Mary. She paid $6 for each dress. How much did Mary's dresses cost? $12
4. Find the cost of these things:

3 pencils at 2¢ each 6¢	4 marbles at 2¢ each 8¢
6 stamps at 2¢ each 12¢	2 balloons at 5¢ each 10¢
2 stamps at 3¢ each 6¢	2 stamps at 7¢ each 14¢
2 apples at 6¢ each 12¢	2 oranges at 9¢ each 18¢

Tell the answers:

5. $2 \times 3 = \overset{6}{\ldots}$ $\qquad 2 \times 8 = \overset{16}{\ldots}$ $\qquad 2 \times 2 = \overset{4}{\ldots}$

6. $2 \times 5 = \overset{10}{\ldots}$ $\qquad 2 \times 9 = \overset{18}{\ldots}$ $\qquad 2 \times 6 = \overset{12}{\ldots}$

7. $2 \times 1 = \overset{2}{\ldots}$ $\qquad 2 \times 7 = \overset{14}{\ldots}$ $\qquad 2 \times 4 = \overset{8}{\ldots}$

8. In ex. 5 to 7, reverse the numbers in each fact. Then tell the answers again. (Same answers as for ex. 5-7).

Multiply these numbers:

9.	2	2	2	9	2	2	3	2	2
	9	8	5	2	7	2	2	1	4
	18	16	10	18	14	4	6	2	8
10.	2	2	4	6	8	1	7	2	5
	2	6	2	2	2	2	2	3	2
	4	12	8	12	16	2	14	6	10

11. In ex. 9 and 10, multiply the numbers again and add 1 to each answer. In ex. 9 the first answer is 19. See Guide.

Do all work orally. Stress fact that if pupil forgets fact, he can use the reverse. In ex. 9-10 be sure pupils say "nine 2's are 18," and so on. Have pupils make up own problems for class to solve.

Present oral review. Continue work of page 208.

Oral Practice

1. What is the cost of eight 2-cent stamps? 16¢

2. Read these numerals: $\overset{\text{Ten}}{\text{X}}$, $\overset{\text{Four}}{\text{IV}}$, $\overset{\text{Eight}}{\text{VIII}}$, $\overset{\text{Twelve}}{\text{XII}}$, $\overset{\text{Six}}{\text{VI}}$.

3. Tell what each of these numbers means: See Guide.

985 700 1586 3800 4703 2009

Tell the numbers to put in the spaces:

4. 1 dime = .10. cents   1 quart = .2. pints
5. 1 foot = .12. inches   2 quarts = .4. pints
6. 1 dollar = .100. cents   1 dozen = .12. things
7. 2 dimes = .20. cents   1 quarter = .5. nickels

Tell the answers. Watch the signs: Stress.

8. $\begin{array}{r} 9 \\ +8 \\ \hline 17 \end{array}$ $\begin{array}{r} 12 \\ -9 \\ \hline 3 \end{array}$ $\begin{array}{r} 10 \\ -7 \\ \hline 3 \end{array}$ $\begin{array}{r} 9 \\ +5 \\ \hline 14 \end{array}$ $\begin{array}{r} 7 \\ +8 \\ \hline 15 \end{array}$ $\begin{array}{r} 11 \\ -7 \\ \hline 4 \end{array}$ $\begin{array}{r} 8 \\ +4 \\ \hline 12 \end{array}$

9. $\begin{array}{r} 9 \\ +4 \\ \hline 13 \end{array}$ $\begin{array}{r} 4 \\ +7 \\ \hline 11 \end{array}$ $\begin{array}{r} 16 \\ -9 \\ \hline 7 \end{array}$ $\begin{array}{r} 15 \\ -6 \\ \hline 9 \end{array}$ $\begin{array}{r} 13 \\ -6 \\ \hline 7 \end{array}$ $\begin{array}{r} 6 \\ +8 \\ \hline 14 \end{array}$ $\begin{array}{r} 10 \\ -4 \\ \hline 6 \end{array}$

10. Find the sum of 4¢, 3¢, 7¢, and 5¢. 19¢

Multiply these numbers: Write in horizontal form also.

11. $\begin{array}{r} 2 \\ 6 \\ \hline 12 \end{array}$ $\begin{array}{r} 3 \\ 2 \\ \hline 6 \end{array}$ $\begin{array}{r} 8 \\ 2 \\ \hline 16 \end{array}$ $\begin{array}{r} 2 \\ 2 \\ \hline 4 \end{array}$ $\begin{array}{r} 2 \\ 4 \\ \hline 8 \end{array}$ $\begin{array}{r} 9 \\ 2 \\ \hline 18 \end{array}$ $\begin{array}{r} 1 \\ 2 \\ \hline 2 \end{array}$ $\begin{array}{r} 2 \\ 8 \\ \hline 16 \end{array}$ $\begin{array}{r} 6 \\ 2 \\ \hline 12 \end{array}$

12. $\begin{array}{r} 2 \\ 1 \\ \hline 2 \end{array}$ $\begin{array}{r} 2 \\ 5 \\ \hline 10 \end{array}$ $\begin{array}{r} 7 \\ 2 \\ \hline 14 \end{array}$ $\begin{array}{r} 2 \\ 9 \\ \hline 18 \end{array}$ $\begin{array}{r} 2 \\ 3 \\ \hline 6 \end{array}$ $\begin{array}{r} 5 \\ 2 \\ \hline 10 \end{array}$ $\begin{array}{r} 2 \\ 7 \\ \hline 14 \end{array}$ $\begin{array}{r} 8 \\ 2 \\ \hline 16 \end{array}$ $\begin{array}{r} 4 \\ 2 \\ \hline 8 \end{array}$

13. Do ex. 11 and 12 again and add 1 to each answer. In ex. 11 the first answer is 13. Ex. 11: 13, 7, 17, 5, 9, 19, 3, 17, 13; ex. 12: 3, 11, 15, 19, 7, 11, 15, 17, 9

Reinforce relationship of addition and multiplication by having pupils verify answers in ex. 11–12 by adding (add six 2's, two 3's, and so on).

Introduce multiplication of 2-place numbers by 2 without carrying.
Relate multiplication to addition.

Making Cookies

1. Problem The children are making cookies to sell. Each pan holds 24 cookies. How many cookies can be baked in 2 pans? 48

Explanation You can find the answer by adding 24 and 24. Stress that ones are added first.

$$\begin{array}{r} 24 \\ +24 \\ \hline 48 \end{array}$$

Another way is to multiply 24 by 2, as shown at the right. Think, "2 × 4 ones = 8 ones." Write 8 in ones place. Think, "2 × 2 tens = 4 tens." Write 4 in tens place. The answer is 48. The children can bake 48 cookies in 2 pans.

$$\begin{array}{r} 24 \\ \times 2 \\ \hline 48 \end{array}$$

To check, go over the work. If you get the same answer again, your work is probably right.

Have pupils do and explain ex. 2 as shown above.

Multiply. Check your work by going over it:

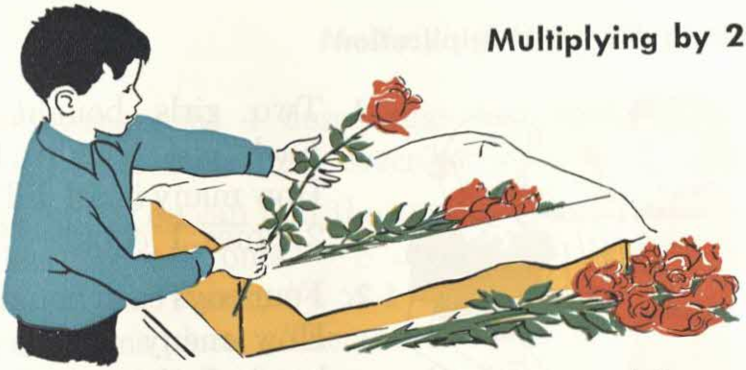
2.	23	14	31	12	34	21	423	143
	2	2	2	2	2	2	2	2
	46	28	62	24	68	42	846	286

More Practice. See ㊱ on page 325.

Emphasize place value by showing other ways to multiply, such as those shown on the right.

$$\begin{array}{r} 2 \text{ tens} + 4 \text{ ones} \\ \text{x } 2 \\ \hline 4 \text{ tens} + 8 \text{ ones} \end{array} \qquad \begin{array}{r} 20 + 4 \\ \text{x } 2 \\ \hline 40 + 8 \end{array}$$

Multiplying by 2



1. **Problem** Dick helps his father pack boxes of flowers to send to the city. He puts 72 flowers in each large box. How many flowers does he pack in 2 large boxes? 144

Explanation You must multiply 72 by 2. Remember that 72 means 7 tens and 2 ones.

Think, "2 × 2 ones = 4 ones." Write 4 in ones place. Think, "2 × 7 tens = 14 tens, or 1 hundred and 4 tens." Write 4 in tens place and 1 in hundreds place. The answer is 144. There are 144 flowers in 2 boxes.

$$\begin{array}{r}72\\ \times 2\\ \hline 144\end{array}$$

Multiply. Check your work by going over it:

2.	$\begin{array}{r}91\\ 2\\ \hline 182\end{array}$	$\begin{array}{r}62\\ 2\\ \hline 124\end{array}$	$\begin{array}{r}54\\ 2\\ \hline 108\end{array}$	$\begin{array}{r}41\\ 2\\ \hline 82\end{array}$	$\begin{array}{r}13\\ 2\\ \hline 26\end{array}$	$\begin{array}{r}134\\ 2\\ \hline 268\end{array}$	$\begin{array}{r}224\\ 2\\ \hline 448\end{array}$
3.	$\begin{array}{r}52\\ 2\\ \hline 104\end{array}$	$\begin{array}{r}83\\ 2\\ \hline 166\end{array}$	$\begin{array}{r}92\\ 2\\ \hline 184\end{array}$	$\begin{array}{r}73\\ 2\\ \hline 146\end{array}$	$\begin{array}{r}34\\ 2\\ \hline 68\end{array}$	$\begin{array}{r}342\\ 2\\ \hline 684\end{array}$	$\begin{array}{r}231\\ 2\\ \hline 462\end{array}$
4.	$\begin{array}{r}81\\ 2\\ \hline 162\end{array}$	$\begin{array}{r}74\\ 2\\ \hline 148\end{array}$	$\begin{array}{r}53\\ 2\\ \hline 106\end{array}$	$\begin{array}{r}82\\ 2\\ \hline 164\end{array}$	$\begin{array}{r}21\\ 2\\ \hline 42\end{array}$	$\begin{array}{r}333\\ 2\\ \hline 666\end{array}$	$\begin{array}{r}413\\ 2\\ \hline 826\end{array}$
5.	$\begin{array}{r}94\\ 2\\ \hline 188\end{array}$	$\begin{array}{r}61\\ 2\\ \hline 122\end{array}$	$\begin{array}{r}84\\ 2\\ \hline 168\end{array}$	$\begin{array}{r}93\\ 2\\ \hline 186\end{array}$	$\begin{array}{r}43\\ 2\\ \hline 86\end{array}$	$\begin{array}{r}634\\ 2\\ \hline 1268\end{array}$	$\begin{array}{r}732\\ 2\\ \hline 1464\end{array}$
6.	$\begin{array}{r}32\\ 2\\ \hline 64\end{array}$	$\begin{array}{r}64\\ 2\\ \hline 128\end{array}$	$\begin{array}{r}42\\ 2\\ \hline 84\end{array}$	$\begin{array}{r}71\\ 2\\ \hline 142\end{array}$	$\begin{array}{r}63\\ 2\\ \hline 126\end{array}$	$\begin{array}{r}124\\ 2\\ \hline 248\end{array}$	$\begin{array}{r}223\\ 2\\ \hline 446\end{array}$

Again, be sure pupils follow procedure in ex. 1 explanation in doing ex. 2-6. Stress place value and order of multiplication (ones, tens, hundreds).

Using 1's in Multiplication

1. Two girls bought lollipops. Each girl bought 1 lollipop. How many in all did they buy? 2 2 times 1 equals $\overset{2}{\ldots}$.

2. Four boys each bought 1 pencil. How many pencils did they buy? 4 4 times 1 equals $\overset{4}{\ldots}$.

3. Jim bought 6 pieces of candy. Each piece cost 1¢. What did Jim pay for them? 6¢ 6 times 1 equals $\overset{6}{\ldots}$.

Any number × 1 = that number.
1 × any number = that number.

What numbers should be put in the spaces?

4. $3 \times 1 = 1 \times \overset{3}{\ldots}$ $5 \times 1 = 1 \times \overset{5}{\ldots}$ $8 \times 1 = 1 \times \overset{8}{\ldots}$

5. $7 \times 1 = 1 \times \overset{7}{\ldots}$ $9 \times 1 = 1 \times \overset{9}{\ldots}$ $6 \times 1 = 1 \times \overset{6}{\ldots}$

6. Here are all the multiplication facts with 1's:

$$\begin{array}{r}1\\ \times 2\\ \hline 2\end{array}\quad\begin{array}{r}2\\ \times 1\\ \hline 2\end{array}\qquad\begin{array}{r}1\\ \times 3\\ \hline 3\end{array}\quad\begin{array}{r}3\\ \times 1\\ \hline 3\end{array}\qquad\begin{array}{r}1\\ \times 4\\ \hline 4\end{array}\quad\begin{array}{r}4\\ \times 1\\ \hline 4\end{array}\qquad\begin{array}{r}1\\ \times 5\\ \hline 5\end{array}\quad\begin{array}{r}5\\ \times 1\\ \hline 5\end{array}\qquad\begin{array}{r}1\\ \times 1\\ \hline 1\end{array}$$

$$\begin{array}{r}1\\ \times 6\\ \hline 6\end{array}\quad\begin{array}{r}6\\ \times 1\\ \hline 6\end{array}\qquad\begin{array}{r}1\\ \times 7\\ \hline 7\end{array}\quad\begin{array}{r}7\\ \times 1\\ \hline 7\end{array}\qquad\begin{array}{r}1\\ \times 8\\ \hline 8\end{array}\quad\begin{array}{r}8\\ \times 1\\ \hline 8\end{array}\qquad\begin{array}{r}1\\ \times 9\\ \hline 9\end{array}\quad\begin{array}{r}9\\ \times 1\\ \hline 9\end{array}$$

Have pupil enter facts on multiplication tables.

Multiply. Tell the answers:

7.
$$\begin{array}{r}11\\ 6\\ \hline 66\end{array}\qquad\begin{array}{r}11\\ 2\\ \hline 22\end{array}\qquad\begin{array}{r}11\\ 9\\ \hline 99\end{array}\qquad\begin{array}{r}11\\ 5\\ \hline 55\end{array}\qquad\begin{array}{r}24\\ 1\\ \hline 24\end{array}\qquad\begin{array}{r}11\\ 3\\ \hline 33\end{array}\qquad\begin{array}{r}85\\ 1\\ \hline 85\end{array}\qquad\begin{array}{r}11\\ 4\\ \hline 44\end{array}$$

Urge pupils to generalize after discussing ex. 1–3. Stress that first example in ex. 7 is read: "six 11's," "6 times 11," or "11 multiplied by 6," never as a reversal of any of these forms.

Multiplying Larger Numbers

1. **Problem** Jack sold 4 dozen eggs last week. How many eggs are there in 4 dozen? 48

Explanation You can find the answer by multiplying.

Think, "4 × 2 ones = 8 ones." Write 8 in ones place. Think, "4 × 1 ten = 4 tens." Write 4 in tens place. The answer is 48. Jack sold 48 eggs in all.

$$\begin{array}{r} 12 \\ \times 4 \\ \hline 48 \end{array}$$

2. **Problem** Last week our school gave a play 3 times. Each time 212 people came to see it. How many people in all saw the school play? 636

Explanation Multiply to find the answer.

Think, "3 × 2 ones = 6 ones." Write 6 in ones place. Think, "3 × 1 ten = 3 tens." Write 3 in tens place. Think, "3 × 2 hundreds = 6 hundreds." Write 6 in hundreds place. The answer is 636. There were 636 people in all.

$$\begin{array}{r} 212 \\ \times 3 \\ \hline 636 \end{array}$$

Check the work by going over it.

Multiply and check your work: Have slower pupils explain work.

3.	21 4 84	11 8 88	61 2 122	22 4 88	231 2 462	214 2 428	111 8 888
4.	22 3 66	14 2 28	11 4 44	12 3 36	415 1 415	114 2 228	413 2 826
5.	43 2 86	11 7 77	21 3 63	22 2 44	111 6 666	321 2 642	112 4 448
6.	11 9 99	86 1 86	12 2 24	21 5 105	113 2 226	243 2 486	122 3 366

Stress place value of multiplicand figures and order of multiplication.
Urge rapid learners to do ex. 3-6 mentally, writing only products.
Provide practice on multiplication facts as needed.

Multiplying Money

1. **Problem** The children are making toys to sell. They want to make money for school movies. Yesterday Tom bought 2 cans of white paint at \$.73 a can. How much did the paint cost? \$1.46

Explanation Multiply \$.73 by 2, like this: Think, "2 × 3¢ = 6¢." Write 6 in cents place. Think, "2 × 7 dimes = 14 dimes. 14 dimes equal 1 dollar and 4 dimes." Write 4 in dimes place and 1 in dollars place.

$$\begin{array}{r} \$.73 \\ \times 2 \\ \hline \$1.46 \end{array}$$

Put the sign \$ and the decimal point in the answer. Stress. The point comes between the dollars and the dimes. The answer is \$1.46. How much did the paint cost? \$1.46

2. **Problem** The children will sell the boats they make for \$1.22 each. How much will they get for 4 boats? \$4.88

Explanation Think, "4 × 2¢ = 8¢." Write 8 in cents place. Think, "4 × 2 dimes = 8 dimes." Write 8 in dimes place. Tell how to finish the multiplication. Think "4x\$1=\$4," and write 4 in dollars place; put in dollar sign and decimal point.

$$\begin{array}{r} \$1.22 \\ \times 4 \\ \hline \$4.88 \end{array}$$

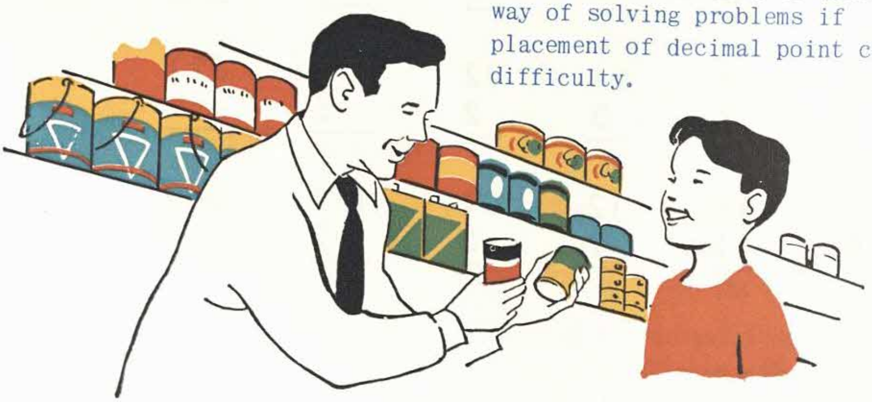
3. Find the cost of 2 cans of paint at \$.34 each. \$.68

4. Find the cost of 3 hammers at \$1.32 each. \$3.96

5. At \$3.12 each, 2 airplanes sell for how much? \$6.24

6. Find the cost of 2 balls of string at \$.23 each. \$.46

Be sure pupils explain work as in ex. 1–2. Refer them to additive way of solving problems if placement of decimal point causes difficulty.



7. Some girls are making toy animals to sell. They get $1.21 for each animal. How much do they get for 2 animals? $2.42 for 3 animals? $3.63 for 4 animals? $4.84

Multiply. **Check your work by going over it:**

8.	$.21 2 $.42	$.54 2 $1.08	$3.14 2 $6.28	$1.43 2 $2.86	$4.11 2 $8.22
9.	$.33 2 $.66	$.12 3 $.36	$2.21 3 $6.63	$4.21 2 $8.42	$3.42 2 $6.84
10.	$.63 2 $1.26	$.21 8 $1.68	$1.23 2 $2.46	$2.22 4 $8.88	$4.34 2 $8.68
11.	$.81 2 $1.62	$.92 2 $1.84	$4.23 2 $8.46	$1.11 7 $7.77	$2.12 4 $8.48

Develop two multiplication thought patterns. Begin new chart showing these patterns and illustrated examples.

Learning When to Multiply

1. Jack bought 2 bags of marbles. In each bag there were 24 marbles. How many marbles did Jack buy? 48
▶ You see Jack bought 2 times 24 marbles. How many marbles did he buy? 48

2. Ann bought 4 boxes of paper cups. There were 12 cups in each box. How many cups did Ann buy? 48

3. Mother bought 2 boxes of cookies. There were 34 cookies in each box. How many cookies did she buy? 68

4. There are 144 sheets of paper in a package. How many sheets are there in 2 packages? 288

Stress and have pupils illustrate in problems.

Suppose you know the number of things in one group. You multiply to find the number of things in two or more groups of the same size.

5. Bill bought 2 dozen oranges. He paid 43¢ a dozen for them. How much did the oranges cost? 86¢

6. Mary paid 32¢ each for 2 tickets to the movies. Jane went with her. How much did the tickets cost? 64¢

7. Find the cost of 4 bottles of milk at 22¢ each. 88¢

8. Find the cost of 2 boxes of crayons at 23¢ each. 46¢

Stress and have pupils illustrate in problems.

Suppose you know the cost of one thing. You multiply to find the cost of two or more of these things.

Lead pupils to see that the groups which are put together are of equal size and hence the problems could be solved either by addition or multiplication. Multiplication is much quicker, however, when several groups of the same size are put together.

Present oral review of addition, subtraction, and multiplication problems.

Oral Problems

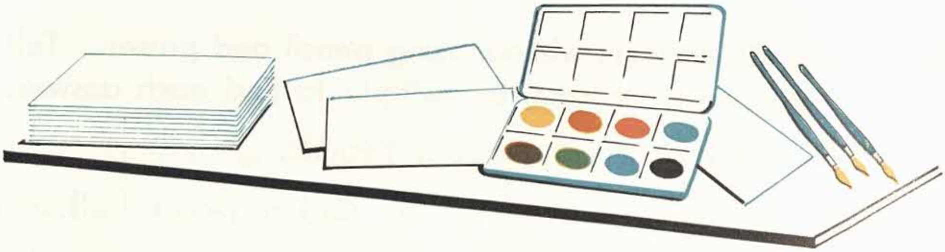
Try to get the answers without using pencil and paper. Tell whether you add, subtract, or multiply to find each answer:

1. Find the cost of two 3-cent pencils. Multiply; 6¢
2. Find the cost of a 5-cent toy and a 7-cent ball. Add; 12¢
3. Bill had a quarter. After he bought a balloon, he had 10 cents left. Find the cost of the balloon. Subtract; 15¢
4. At Joe's party there were 16 children. 8 of them were girls. How many boys were there? Subtract; 8
5. Jane spent 3¢, 5¢, 1¢, and 8¢ at the school store. How much in all did Jane spend? Add; 17¢
6. Dick has a dime. If he spends 8¢ for ice cream, how much money will he have left? Subtract; 2¢
7. Mary drinks 2 glasses of milk a day. How many glasses of milk does she drink in 7 days? Multiply; 14
8. Jack has 8¢ in his pocket and a nickel in his hand. How much money has Jack? Add; 13¢
9. Alice bought two 5-cent candy bars. How much did she spend for them? Multiply; 10¢
10. Tom needs 15¢ for paper. He has 9¢ now. How much more does Tom need to buy the paper? Subtract; 6¢
11. Sally bought 6 lollipops. At 2¢ each, how much did she pay for the lollipops? Multiply; 12¢
12. Mother had 1 dozen eggs. She used 5 of them today. How many eggs are left? Subtract; 7
13. Bob is 9 years old. His sister is 14 years old. How many years older than Bob is his sister? Subtract; 5

Be sure to have pupils explain why they used the different processes. You might ask why they did not multiply in ex. 2, 5, and if they could have added in ex. 1, 7, 9, 11. Stress putting together of "equal" groups.

Maintain addition, subtraction, and multiplications skills.

Problems and Practice



1. Ann bought a box of paints for \$.72. She gave the man \$1.00. How much change did she get? \$.28
▶ You can find the answer by adding the coins Ann got back. You can also find it by subtracting the cost of the paints from \$1.00.

2. Peter bought roller skates for \$4.39. How much change did he get from \$5.00? \$.61

3. Father bought 2 story books for the children. The books cost \$1.34 each. How much did Father pay for the 2 books? \$2.68

Find the answers. Follow the signs: Stress.

4.	$\begin{array}{r}254\\+132\\\hline 386\end{array}$	$\begin{array}{r}348\\+506\\\hline 854\end{array}$	$\begin{array}{r}292\\+185\\\hline 477\end{array}$	$\begin{array}{r}166\\+257\\\hline 423\end{array}$	$\begin{array}{r}364\\+136\\\hline 500\end{array}$	$\begin{array}{r}209\\+396\\\hline 605\end{array}$
5.	$\begin{array}{r}438\\+425\\\hline 863\end{array}$	$\begin{array}{r}650\\+250\\\hline 900\end{array}$	$\begin{array}{r}487\\+429\\\hline 916\end{array}$	$\begin{array}{r}470\\+324\\\hline 794\end{array}$	$\begin{array}{r}557\\+208\\\hline 765\end{array}$	$\begin{array}{r}172\\+328\\\hline 500\end{array}$
6.	$\begin{array}{r}356\\-104\\\hline 252\end{array}$	$\begin{array}{r}474\\-229\\\hline 245\end{array}$	$\begin{array}{r}828\\-164\\\hline 664\end{array}$	$\begin{array}{r}912\\-689\\\hline 223\end{array}$	$\begin{array}{r}204\\-108\\\hline 96\end{array}$	$\begin{array}{r}915\\-729\\\hline 186\end{array}$
7.	$\begin{array}{r}683\\-549\\\hline 134\end{array}$	$\begin{array}{r}300\\-256\\\hline 44\end{array}$	$\begin{array}{r}459\\-269\\\hline 190\end{array}$	$\begin{array}{r}586\\-398\\\hline 188\end{array}$	$\begin{array}{r}600\\-245\\\hline 355\end{array}$	$\begin{array}{r}490\\-397\\\hline 93\end{array}$
8.	$\begin{array}{r}\$.34\\\times 2\\\hline \$.68\end{array}$	$\begin{array}{r}\$.42\\\times 2\\\hline \$.84\end{array}$	$\begin{array}{r}\$.54\\\times 2\\\hline \$1.08\end{array}$	$\begin{array}{r}\$3.14\\\times 2\\\hline \$6.28\end{array}$	$\begin{array}{r}\$1.32\\\times 2\\\hline \$2.64\end{array}$	$\begin{array}{r}\$4.13\\\times 2\\\hline \$8.26\end{array}$

Observe pupils as they work. Remind them of order of processes (ones, tens, hundreds). Note if difficulties are caused by process or facts. Plan reteaching or drill.

Introduce the multiplication facts for the 3's. (The 3's are continued on page 220.)

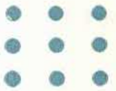
Learning about the 3's

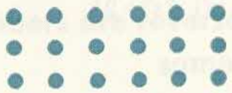
1. There are 3 pennies in each group above. To find how many pennies there are in all, add four 3's, as shown at the right. How many are four 3's? 12 4 times 3 equals ... 12

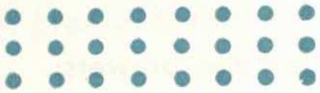
3
3
3
3

2. You can also find how many pennies there are by counting by 3's. Say "3, 6, 9, 12." How far can you count by 3's? Try it.

3. When you say "four 3's are 12," you are **multiplying.** Stress. You can write "four 3's are 12" like this: $4 \times 3 = 12$.


A
3x3=9


B
6x3=18


C
8x3=24

4. Look at picture A. What multiplication fact does it show? What fact about 3 does B show? What fact about 3 does C show? Write these new facts.

5. Use play pennies to show what 5×3 equals. How much is 5×3? 15 Use play pennies to show what 7×3 equals; 21 to show what 9×3 equals. 27

Urge pupils to say, "Five 3's are...," etc.

Try to tell what number goes in each space:

6. $5 \times 3 =$ ... 15 $2 \times 3 =$ ... 6 $8 \times 3 =$ ... 24

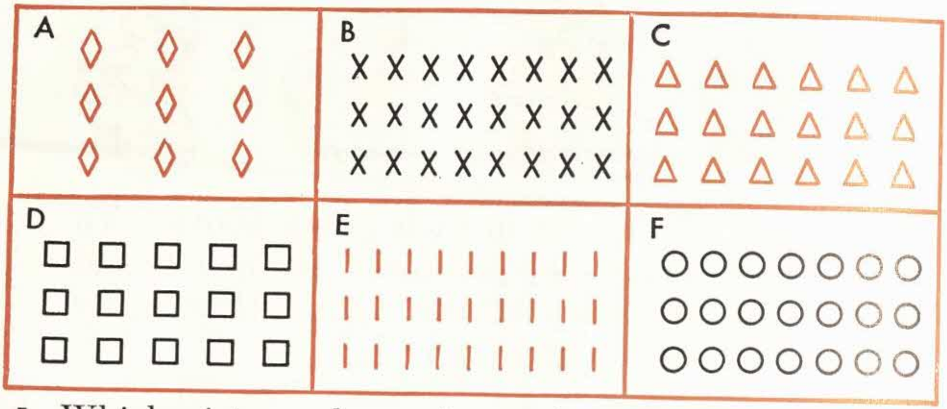
7. $7 \times 3 =$ ... 21 $9 \times 3 =$ ... 27 $4 \times 3 =$ ... 12

8. $1 \times 3 =$ ... 3 $3 \times 3 =$ ... 9 $6 \times 3 =$ ... 18

Let the pupils use counters, make dot diagrams, and so forth as they study the facts. Have them frequently verify products by addition. Encourage pupils to discover relationships among the facts and to "think" products mentally.

Continue to emphasize relationships among the various facts. After facts are learned, enter them in a table (see page 200).

The 3's in Multiplication



1. Which picture above shows that $5 \times 3 = 15$? D
2. Which picture above shows that $8 \times 3 = 24$? B
3. Tell what multiplication facts about 3 pictures A, C, E, and F show. What other multiplication facts do pictures B, C, D, E, and F show? (A) $3 \times 3 = 9$, (C) $6 \times 3 = 18$, (E) $9 \times 3 = 27$, (F) $7 \times 3 = 21$

Tell the answers:

4. $7 \times 3 = \ldots$ 21 $6 \times 3 = \ldots$ 18 Four 3's are . . . 12
5. $3 \times 3 = \ldots$ 9 $2 \times 3 = \ldots$ 6 Nine 3's are . . . 27
6. $8 \times 3 = \ldots$ 24 $1 \times 3 = \ldots$ 3 Five 3's are . . . 15
7. Learn these multiplication facts: Make practice cards.

3	3	3	3	3	3	3	3	3
×1	×2	×3	×4	×5	×6	×7	×8	×9
3	6	9	12	15	18	21	24	27

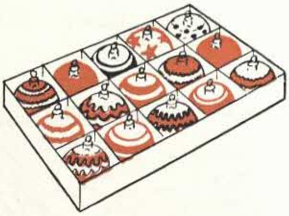
Question pupils about relationships among the facts.

8. A stamp costs 3¢. How much must Jim pay for 8 stamps? 24 for 5 stamps? 15 for 2 stamps? 6 for 9 stamps? 27
9. At 3¢ each, find the cost of 4 pencils; 12 6 pencils. 18
10. There are 3 buttons on a card. How many buttons are there on 6 cards? 18 on 5 cards? 15 on 4 cards? 12

Write exercises such as the following on the board for pupils to complete: "Since five 3's = 15, then six 3's = 15 + ______ = ______, and four 3's = 15 − ______ = ______." Learning number facts is made easier and more enjoyable in this manner.

Teach reverses of the 3's. Enter them in tables.

The 3's in Multiplication



1. Susan bought some balls for the Christmas tree. They came in a box like the one shown in the picture. How many balls did she buy? 15 Count them.

2. Jack says there are 5 rows and 3 balls in each row. How many are 5 × 3? 15 Susan says there are 3 rows and 5 balls in each row. 3 × 5 = ? 15 Is 5 × 3 the same as 3 × 5? Yes The numbers in 3 × 5 are the same as those in 5 × 3 but they are reversed. 3 × 5 and 5 × 3 are a pair of multiplication facts.

$$\begin{array}{r}3\\ \times 5\\ \hline 15\end{array} \qquad \begin{array}{r}5\\ \times 3\\ \hline 15\end{array}$$

Stress.

If two numbers are reversed, their product is the same.

This generalization is often referred to as the commutative principle for multiplication.

3. Learn these multiplication facts with 3's: Make fact cards.

$$\begin{array}{r}3\\ \times 1\\ \hline 3\end{array} \quad \begin{array}{r}1\\ \times 3\\ \hline 3\end{array} \qquad \begin{array}{r}3\\ \times 2\\ \hline 6\end{array} \quad \begin{array}{r}2\\ \times 3\\ \hline 6\end{array} \qquad \begin{array}{r}3\\ \times 4\\ \hline 12\end{array} \quad \begin{array}{r}4\\ \times 3\\ \hline 12\end{array} \qquad \begin{array}{r}3\\ \times 5\\ \hline 15\end{array} \quad \begin{array}{r}5\\ \times 3\\ \hline 15\end{array} \qquad \begin{array}{r}3\\ \times 3\\ \hline 9\end{array}$$

$$\begin{array}{r}3\\ \times 6\\ \hline 18\end{array} \quad \begin{array}{r}6\\ \times 3\\ \hline 18\end{array} \qquad \begin{array}{r}3\\ \times 7\\ \hline 21\end{array} \quad \begin{array}{r}7\\ \times 3\\ \hline 21\end{array} \qquad \begin{array}{r}3\\ \times 8\\ \hline 24\end{array} \quad \begin{array}{r}8\\ \times 3\\ \hline 24\end{array} \qquad \begin{array}{r}3\\ \times 9\\ \hline 27\end{array} \quad \begin{array}{r}9\\ \times 3\\ \hline 27\end{array}$$

4. 7 × 3 = $\overset{21}{\ldots}$, so 3 × 7 = $\overset{21}{\ldots}$ Six 3's are $\overset{18}{\ldots}$.

5. 9 × 3 = $\overset{27}{\ldots}$, so 3 × 9 = $\overset{27}{\ldots}$ Four 3's are $\overset{12}{\ldots}$.

6. 8 × 3 = $\overset{24}{\ldots}$, so 3 × 8 = $\overset{24}{\ldots}$ Five 3's are $\overset{15}{\ldots}$.

Have the pupils verify with counters that five 3's equal three 5's. Lead them to see the meaning and use of the generalization in the rectangle. Encourage statements such as, "Since 3 x 9 = 27, then 9 x 3 = 27."

Practicing the 3's

1. A piece of candy costs 3¢. So the cost of 2 pieces of candy is .6.¢. 5 pieces of candy cost 15.¢. 9 pieces cost 27.¢.

2. At 3¢ each, what will it cost to buy 7 stamps? 21¢ 4 stamps? 12¢ 6 stamps? 18¢ 3 stamps? 9¢ 8 stamps? 24¢

3. How many days are there in a week? 7 How many days are there in 3 weeks? 21

4. At Peggy's party 4 children sat at each small table. There were 3 tables. How many children were there at the tables? 12

5. Jack forgets the answer to 3 × 7. He reverses the numbers and gets 7 × 3. He remembers that 7 × 3 = .21., so 3 × 7 = .21.

6. What do you do if you forget 3 × 8? if you forget 3 × 6? if you forget 3 × 9? Reverse the numbers.

7. How many cents are there in 3 nickels?

Tell the answer to each multiplication fact: Stress "three 4's" and so on.

8. 3 × 4 12 6 × 3 18 3 × 3 9 3 × 8 24 3 × 1 3
9. 3 × 2 6 8 × 3 24 7 × 3 21 2 × 3 6 3 × 5 15
10. 9 × 3 27 3 × 7 21 5 × 3 15 3 × 6 18 3 × 9 27

11.	3 ×6 18	3 ×4 12	1 ×3 3	3 ×9 27	3 ×3 9	1 ×2 2	7 ×3 21	3 ×1 3	2 ×3 6
12.	4 ×3 12	9 ×3 27	3 ×5 15	6 ×3 18	8 ×3 24	3 ×7 21	5 ×3 15	3 ×2 6	3 ×8 24

This work should be done orally. Urge pupils to increase speed of response. Use fact cards for drill if needed. Check understandings by having pupils use facts in own problems.

Problems and Practice

1. Mother cooks 3 eggs for breakfast each morning. How many eggs does she cook in 7 mornings? 21

2. Susan made 3 sandwiches for each child at her party. For 8 children, how many sandwiches did she make? 24

3. Tom feeds his rabbit 3 carrots a day. How many carrots does he feed his rabbit in 3 days? 9 in 4 days? 12

4. There are 6 rolls in a package. How many rolls are there in 3 packages? 18

5. Find the cost of 2 toy boats at $3 each. $6

Multiply these numbers: Stress "seven 3's."

6. $\begin{array}{r}3\\7\\\hline 21\end{array}\quad\begin{array}{r}4\\3\\\hline 12\end{array}\quad\begin{array}{r}3\\2\\\hline 6\end{array}\quad\begin{array}{r}3\\5\\\hline 15\end{array}\quad\begin{array}{r}8\\3\\\hline 24\end{array}\quad\begin{array}{r}1\\3\\\hline 3\end{array}\quad\begin{array}{r}3\\6\\\hline 18\end{array}\quad\begin{array}{r}2\\3\\\hline 6\end{array}\quad\begin{array}{r}3\\3\\\hline 9\end{array}$

7. $\begin{array}{r}3\\4\\\hline 12\end{array}\quad\begin{array}{r}6\\3\\\hline 18\end{array}\quad\begin{array}{r}3\\9\\\hline 27\end{array}\quad\begin{array}{r}7\\3\\\hline 21\end{array}\quad\begin{array}{r}4\\3\\\hline 12\end{array}\quad\begin{array}{r}3\\8\\\hline 24\end{array}\quad\begin{array}{r}5\\3\\\hline 15\end{array}\quad\begin{array}{r}3\\1\\\hline 3\end{array}\quad\begin{array}{r}9\\3\\\hline 27\end{array}$

8. Do ex. 6 and 7 again and add 1 to each answer. The first answer is 22. Try this again and add 2. See Guide.

Multiply. Check your work by going over it: Add also to check.

9. $\begin{array}{r}13\\3\\\hline 39\end{array}\quad\begin{array}{r}31\\6\\\hline 186\end{array}\quad\begin{array}{r}32\\3\\\hline 96\end{array}\quad\begin{array}{r}83\\3\\\hline 249\end{array}\quad\begin{array}{r}32\\4\\\hline 128\end{array}\quad\begin{array}{r}213\\3\\\hline 639\end{array}\quad\begin{array}{r}321\\3\\\hline 963\end{array}$

10. $\begin{array}{r}71\\3\\\hline 213\end{array}\quad\begin{array}{r}23\\3\\\hline 69\end{array}\quad\begin{array}{r}31\\5\\\hline 155\end{array}\quad\begin{array}{r}33\\2\\\hline 66\end{array}\quad\begin{array}{r}41\\3\\\hline 123\end{array}\quad\begin{array}{r}132\\3\\\hline 396\end{array}\quad\begin{array}{r}211\\3\\\hline 633\end{array}$

11. $\begin{array}{r}63\\3\\\hline 189\end{array}\quad\begin{array}{r}31\\4\\\hline 124\end{array}\quad\begin{array}{r}34\\2\\\hline 68\end{array}\quad\begin{array}{r}43\\3\\\hline 129\end{array}\quad\begin{array}{r}31\\7\\\hline 217\end{array}\quad\begin{array}{r}333\\3\\\hline 999\end{array}\quad\begin{array}{r}231\\3\\\hline 693\end{array}$

Ex. 1-8 should be done orally. In ex. 9-11 emphasize order of multiplication (ones, tens, hundreds).

The work at bottom of page may help pupils see why the 1 ten carried is added after, not before, multiplying the 2 tens by 3.

Carrying in Multiplication

1. **Problem** Bill bought 3 tickets to the movies. Each ticket cost 24¢. How much did he pay for 3 tickets? 72¢

Explanation Multiply 24 by 3 to find the answer.

Think, "3 × 4¢ = 12¢. 12¢ = 1 dime and 2¢." Write 2 in cents place. Carry 1 dime to dimes column when you do the next step.

Think, "3 × 2 dimes = 6 dimes. 6 dimes + 1 dime (carried) = 7 dimes." Write 7 in dimes place. The answer is 72. Bill paid 72¢ for the tickets.

$$\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \end{array}$$

2. Ann bought 2 bus tickets to Northfield. Each ticket cost 98¢. How much did she pay for 2 tickets? $1.96

▶ Remember to write your answer in dollars and cents.

Multiply. Check your work by going over it: Have pupils explain work orally.

3.	25 3 75	16 3 48	48 2 96	15 3 45	75 2 150	46 2 92	39 2 78
4.	67 2 134	35 3 105	46 3 138	29 2 58	85 2 170	94 3 282	35 2 70
5.	75 3 225	96 2 192	37 2 74	54 3 162	76 3 228	87 2 174	85 3 255
6.	58 2 116	14 3 42	96 3 288	66 2 132	89 2 178	65 3 195	95 2 190
7.	36 3 108	28 2 56	59 2 118	26 3 78	49 2 98	17 2 34	34 3 102
8.	18 2 36	45 3 135	64 3 192	19 2 38	74 3 222	55 3 165	26 2 52

2 tens + 4 ones
x 3
6 tens + 12 ones, or 7 tens + 2 ones

Continue to emphasize the importance of mental arithmetic. Stress ex. 13–18 (carrying in multiplication) in particular.

Oral Review

1. How many thirds are there in a whole pie? Three

2. How many fourths are there in a whole apple? Four

3. How many cents are 15 cents less 8 cents? 7¢

4. Find the cost of 3 rulers at 8¢ each. 24¢

Tell the answers. Watch the signs:

5. 7 − 3 4   4 + 8 12   2 × 4 8   9 − 8 1   8 + 6 14

6. 2 × 6 12   8 − 2 6   3 + 7 10   2 × 7 14   8 × 1 8

7. 2 × 5 10   3 × 1 3   8 − 3 5   5 + 8 13   9 + 8 17

8. 5 + 7 12   7 × 2 14   6 − 2 4   3 × 5 15   10 − 4 6

9. 9 − 5 4   7 + 6 13   2 × 9 18   9 + 4 13   12 − 9 3

Tell the numbers to put in the spaces:

10. 4 dimes = ...¢ 40   1 nickel and 8 cents = ...¢ 13

11. 7 nickels = ...¢ 35   1 dime and 1 nickel = ...¢ 15

12. 3 quarters = ...¢ 75   1 dime and 1 quarter = ...¢ 35

Multiply. Then add 1 to each answer:

13. 3 × 7 21, 22   9 × 3 27, 28   2 × 9 18, 19   8 × 3 24, 25   3 × 4 12, 13

14. 4 × 3 12, 13   6 × 2 12, 13   4 × 2 8, 9   6 × 3 18, 19   5 × 2 10, 11

15. 5 × 3 15, 16   3 × 2 6, 7   3 × 6 18, 19   5 × 1 5, 6   3 × 9 27, 28

16. 9 × 1 9, 10   3 × 8 24, 25   2 × 7 14, 15   3 × 3 9, 10   9 × 2 18, 19

17. 7 × 3 21, 22   6 × 1 6, 7   7 × 2 14, 15   8 × 2 16, 17   3 × 5 15, 16

18. Multiply the numbers in ex. 13 to 17 again. Then add 2 to each answer. Have pupils add other numbers to above products. Urge them to respond quickly. After pupils know how to "think" a fact by relating it to its reversal or to another fact that is about the same, insist upon regular practice until the facts are known without hesitation.

Present words problems using mixed thought patterns and processes.

The Book Store

1. Mr. Bell sells books for children. Betty spent \$2.50 for a story book and \$1.95 for a bird book. How much did the two books cost? \$4.45

2. Betty gave Mr. Bell \$5.00 to pay for the books. How much change did he give Betty? \$.55 Use your answer to ex. 1. Count the change as Mr. Bell did. \$4.45, \$4.50 \$5.00

3. Jim had \$2.50 to spend for a book. An airplane book he wanted cost \$2.95. How much more did Jim need? \$.45

4. Mary bought 3 books that cost \$1.22 each. How much did these books cost all together? \$3.66

5. The book Bill wanted was not in the store. Mr. Bell said he could get it in 3 weeks. How many days would that be? 21

6. Tom spent \$2.00 for 2 books. One of them cost \$1.35. How much did the other book cost? \$.65

7. Make up a problem about buying books. Then ask the boys and girls to work it.

Introduce work through discussion of pupils' experiences in buying books. In doing problems have pupils give reasons for process used. In ex. 7, let different pupils translate problem into numbers on board, then have class solve it.

Present comprehensive review of all steps in addition.

Addition Practice

Begin at the bottom and add up. Check your work: Stress.

1.	26	19	36	45	78	55	47	67
	21	55	48	36	25	33	45	74
	43	33	22	56	15	28	77	59
	90	107	106	137	118	116	169	200
2.	21	24	21	8	48	79	40	18
	33	66	62	63	90	70	17	68
	9	7	25	34	28	29	8	31
	42	51	8	26	26	44	48	78
	105	148	116	131	192	222	113	195

3. Find the sum of 28, 42, 36; 106 of 48, 16, 59. 123

4. How many cents are 75¢, 45¢, 9¢, and 35¢? 164¢ or $1.64

Write the three numbers in a column. Add up:

5. 5 + 5 + 8 18 60 + 39 + 39 138 79 + 62 + 24 165

6. 4 + 9 + 7 20 57 + 23 + 62 142 58 + 27 + 37 122

7. 7 + 6 + 8 21 73 + 33 + 46 152 93 + 59 + 48 200

8. Add 6 to each of these numbers:

48 54 56 62 23 29 37 43 84 90 19 25 65 71 71 77

9. Add 9 to each number in ex. 8.(1) Add 7 to each.(2) (1) 57, 65, 32, 46, 93, 28, 74, 80; (2) 55, 63, 30, 44, 91, 26, 72, 78

Add and check your work:

10.	186	394	218	186	363	128
	369	143	315	705	259	286
	555	537	533	891	622	414
11.	407	490	195	541	258	101
	93	374	105	275	169	619
	500	864	300	816	427	720
12.	493	356	337	357	59	227
	47	553	67	89	528	66
	146	38	326	415	125	413
	686	947	730	861	712	706

Note any difficulties with zeros, ragged columns, carrying, and so on. Group pupils for reteaching.

Extend linear measure to include yard. Give pupils experience in measuring; see Guide.

How Tall Are They?

1. The boys are measuring to find how tall Susan is. They have a stick 36 inches long. It is called a yardstick. There are 36 inches in a yard. Susan is 8 inches taller than the yardstick. How tall is she? 44 inches

2. Get a yardstick and a foot ruler. Now measure the yardstick with the ruler. Can you tell how many feet there are in 1 yard? 3

3. How many feet are there in 1 yard? 3 How many inches are there in 1 foot? 12 Multiply to find how many inches there are in 3 feet. Is your answer the same as the number of inches in a yard? 36 inches; yes

4. With a yardstick measure a boy and a girl. Tell how many feet and inches tall each one is.

5. Learn this table of measures:

Stress.

12 inches = 1 foot
3 feet = 1 yard
36 inches = 1 yard

Tell which is longer:

6. 1 yard or 1 foot 1 yard

7. 8 feet or 5 yards 5 yards

8. 3 yards or 11 feet 11 feet

9. 15 inches or 1 foot 15 inches

10. 36 inches or 2 yards 2 yards

11. 10 inches or 1 foot 1 foot

Compare yardstick with foot ruler so that pupils can see relationship. Also, point out inch markings on yardstick.

Using Zeros in Multiplication

1. The children are playing beanbag. Jack throws 3 bags. Each one goes into hole 2. How many are three 2's? $3 \times 2 = ?$ 6

2. Ann throws 3 bags. Each one falls on the floor. Ann gets 0 each time a bag falls on the floor. Ann gets $0 + 0 + 0$ for her turn. What is the sum? 0 This shows that three 0's make 0. So $3 \times 0 = 0$.

3. If you throw 2 bags and they both fall on the floor, what do you get? 0 How much is 2×0? 0

4. What is 9×0? 0 4×0? 0 5×0? 0 0×0? 0

5. You know that $6 \times 0 = 0$. If you reverse the numbers, the answer is still 0. This shows that $0 \times 6 = 0$.

$$\begin{array}{r} 0 \\ \times 6 \\ \hline 0 \end{array} \qquad \begin{array}{r} 6 \\ \times 0 \\ \hline 0 \end{array}$$

6. What is 0×8? 0 0×1? 0 0×7? 0 0×3? 0

Point out that principle of reverses applies here as well as to other numbers.

Stress. →

Any number × 0 = 0.
0 × any number = 0.

7. In ex. 2 to 6 above, 12 zero facts in multiplication are given. There are 7 other multiplication facts that have zero. Write them. See Guide.

While it is easy to show by addition that 2 x 0 = 0, it is not so easy to show that 0 x 2 = 0. The table on the right is a good way to illustrate the latter.

3 x 2 = 6
2 x 2 = 4
1 x 2 = 2
0 x 2 = 0

Carrying 2 in Multiplication

1. Problem A bus ticket to Blue Lake costs \$2.09. Joe bought 3 tickets for Bill, Dick, and himself. How much did the tickets cost? \$6.27

Explanation Multiply \$2.09 by 3 to find the answer. Think, "3 × 9¢ = 27¢." Write the 7 in cents place and carry the 2 dimes to dimes column. Think, "3 × 0 dimes = 0 dimes. 0 dimes + 2 dimes (carried) = 2 dimes." Write 2 in dimes place. Think, "3 × \$2 = \$6." Write 6 in dollars place. The answer is \$6.27. The tickets cost \$6.27. Check the work.

Stress.

```
$2.09
    3
-----
$6.27
```

2. A bus ticket to Greenfield costs \$1.28. Find the cost of 3 tickets to Greenfield. \$3.84

Multiply. Check your work by going over it:

3.	67 3 201	58 3 174	23 9 207	\$.48 3 \$1.44	107 3 321	113 5 565	\$3.07 3 \$9.21
4.	79 3 237	13 8 104	68 3 204	\$.29 3 \$.87	448 2 896	109 3 327	\$1.13 6 \$6.78
5.	59 3 177	32 6 192	86 3 258	\$.33 7 \$2.31	103 8 824	118 3 354	\$2.08 3 \$6.24
6.	13 9 117	78 2 156	47 3 141	\$.88 3 \$2.64	103 7 721	209 2 418	\$1.12 8 \$8.96
7.	28 3 84	69 2 138	13 7 91	\$.23 8 \$1.84	318 3 954	339 2 678	\$1.13 7 \$7.91
8.	23 7 161	39 3 117	33 9 297	\$.97 2 \$1.94	305 3 915	102 9 918	\$1.08 3 \$3.24

Have pupils discuss problems with hidden zeros, using ex. 1 procedure. If pupils have difficulty, show as addition. Stress adding carried number "after" multiplying tens.

Find these products. Check your work by going over it:

1.	109	219	124	147	213	308
	2	3	3	2	5	3
	218	657	372	294	1065	924
2.	218	208	139	203	417	436
	3	2	2	7	3	2
	654	416	278	1421	1251	872

3. Ann is stringing beads. She puts 48 beads on each string. How many beads does Ann use for 3 strings? 144

4. Bill's father took Mary and Bill to the circus. He paid $1.25 for each of the 3 tickets. How much did he pay in all? $3.75

5. Some of the boys made tickets for our school play. They made 225 tickets for each day we gave the play. How many tickets did they make for 3 days? 675

6. The milkman brings 112 small bottles of milk to school each school day. How many bottles does he bring in 5 days? 560

7. Mother can bake 36 cookies in one pan. How many cookies can she bake in 3 pans? 108

8. Peggy's father took the family to Grandmother's house. They rode 135 miles to go there. They came home the same way. How many miles did they ride? 270

Multiply and check: Stress order of multiplication.

9.	34	61	30	22	300	109	240
	2	3	9	8	7	3	2
	68	183	270	176	2100	327	480
10.	20	78	56	29	203	245	312
	7	3	2	3	3	2	3
	140	234	112	87	609	490	936

Observe pupils to see if hidden zeros are causing difficulty. Provide extra practice on this, demonstrating on blackboard. Use addition to verify.

MAY

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

The Calendar

1. On page 109 you learned the months of the year. How many months are there? 12 Which is the first month? January Which is the last month? December

2. At the top of this page you see a calendar for May. How many days are there in May? 31 On what day of the week does May begin on this calendar? Thursday On what day of the week does it end? Saturday

3. The first Saturday in May comes on the third day of May. The **date** of that Saturday is May 3. You say the date is **May three** or **May third.** You should tell the year also, like this: May 3, 1969. Often the year is left out when you give a date in this year.

4. Read the dates of all the Sundays in May.

5. Look at the calendar above. On what day of the week does each of these dates come?

   Tuesday May 6 Sunday May 11 Wednesday May 21 Friday May 30

6. Look at the calendar at school. What month is it now? On what day of the week does this month begin?

7. Find your birthday month on the school calendar. What is the date of your birthday? On what day of the week is your birthday this year?

Be sure pupils know days of week and are able to use them. Stress fact that date gives place of day, that is, May 8 is that day which is 8 days after beginning of month.

The Calendar

Use a calendar for this year to answer ex. 1 to 4:

1. How many days are there in January? 31 in February? 28 or 29 in June? 30 in July? 31 in November? 30

January, March, May, July, August, October, December

2. Find all the months that have 31 days. Name them. Does any month have more than 31 days? No

April, June, September, November

3. Find all the months that have 30 days. Name them. Does any month have less than 30 days? Yes If so, tell the name of the month. February

4. What is the date of Christmas? December 25 On what day of the week does Christmas come this year?

(1) Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

5. Name the days of the week.(1) How many days are there in 1 week? 7 in 2 weeks? 14 in 3 weeks? 21

6. Suppose the first Saturday in June is June 7. Without looking at a calendar, tell the date of the second Saturday in June. June 14 How did you find it? Add 7 + 7 Tell the date of the third and fourth Saturdays in June. June 21, June 28

7. Suppose July 4 is the date of the first Friday in July. Tell the dates of all the other Fridays in July. July 11, July 18, July 25

8. One year July 30 came on Wednesday. How many Wednesdays were there in July that year? Five

9. You may take a library book home for 2 weeks. Suppose you take out a book on October 5. On what date must you take the book back? October 19

10. Suppose you take out a library book on each of the dates below. You may keep the book for 2 weeks. On what date must you take the book back?

January 15 January 29 July 7 July 21 August 13 August 27 May 8 May 22

Be sure pupils observe that not all months have same number of days. Consult Guide for ways of remembering number of days. Work directly with calendar in doing ex. 9–10.

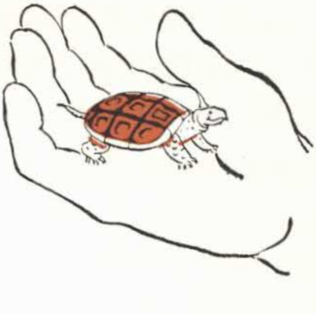
Extend subtraction concepts in solving problems.

Learning More about Subtraction

Illustrate and emphasize.

You subtract when you take a smaller group of things from a larger one.
If you subtract 0 from a group of things, the answer is the same as the group.

1. Jim is 48 inches tall. Bill is 51 inches tall. How much taller is Bill than Jim? 3 inches
2. Mary made 30 pieces of candy. The children ate 12 pieces of it. How many pieces were left then? 18
3. A ball costs 35¢. A top costs 28¢. How much less does the top cost than the ball? 7¢
4. Betty has 15 examples to work. She has finished 9 of them. How many more must she do? 6
5. Ann had 12 tickets to sell. She has only 3 tickets left now. How many tickets has Ann sold? 9
6. Bill has 12 rabbits. Five of them are white and the rest are black. How many black rabbits has he? 7



7. Peter has 19 rabbits. Bill has 12 rabbits. How many more rabbits has Peter than Bill? 7
8. Today Dick earned a half dollar. He bought a turtle for 29¢. How much change did he get? 21¢ Has he enough money left to buy a little fish for 19¢? Yes

Important learning is to help pupils to estimate answers which are reasonable. Demonstrate that difference must always be less than minuend (top number). Also, use objects or pupils to reinforce second concept boxed above.

Present basic subtraction concepts found in problems.

Learning When to Subtract

▶ You subtract in problems that ask you
- (a) to find how many are left.
- (b) to find how much change you should get.
- (c) to find how many are gone.
- (d) to find how many more are needed.
- (e) to find how much more or less one number is than another number.
- (f) to find how much longer or shorter one thing is than another thing.
- (g) to find the other part of a number.

More Problems

Have pupils tell which concept applies in ex. 1-6.

1. Mother made 60 cookies. 24 of them were orange cookies. The rest were nut cookies. How many nut cookies did Mother make? 36

2. A ball costs 30¢. A top costs 15¢. How much does Tom need to buy both the ball and the top? 45¢

3. Ann spends $1.20 each week for school lunches. How much does she spend in 3 weeks? $3.60

4. Peter bought a book for 39¢. He gave the man in the store a dollar bill to pay for it. How much change did Peter get? 61¢ Count the change the way the man would do it. 39, 40, 50, $1.00

5. Jane drinks 3 glasses of milk a day. How many glasses of milk does Jane drink in a week? 21

6. Today Joe unpacked 2 boxes of oranges in his father's store. There were 144 oranges in each box. How many oranges did Joe unpack? 288

Pupils should not memorize concepts, but be able to recognize them in problems. Have them make up own problems illustrating these concepts.

Maintain skills in addition, subtraction, multiplication.

Mixed Practice

Begin at the bottom and add up. Check by adding down:

1.	6	8	7	6	5	4	7	3	7
	8	9	4	5	7	0	8	9	6
	3	0	2	6	4	8	6	5	1
	2	5	7	4	2	8	7	2	8
	19	22	20	21	18	20	28	19	22
2.	5	5	7	4	9	4	7	4	7
	6	7	5	7	3	8	6	8	5
	9	2	5	9	8	6	3	4	2
	3	6	9	8	1	6	5	3	5
	23	20	26	28	21	24	21	19	19

Write these numbers in columns and add or subtract them:

3. 325 + 136 461 740 − 711 29 99 + 25 + 11 135

4. 529 − 359 170 298 + 289 587 36 + 14 + 57 107

5. 400 − 256 144 203 − 195 8 64 + 12 + 89 165

6. 446 − 369 77 539 − 207 332 69 + 14 + 28 111

7. 183 + 463 646 332 + 568 900 91 + 33 + 84 208

8. Add 8 to each number below;(1) add 7;(2) add 9:(3)

(1)	57	70	41	94	23	82	29	66
	49	62	33	86	15	74	21	58
(2)	56	69	40	93	22	81	28	65
(3)	58	71	42	95	24	83	30	67

9. Subtract 10 from each number in ex. 8.(1) Subtract 5 from each one.(2) (1) 39, 52, 23, 76, 5, 64, 11, 48; (2) 44, 57, 28, 81, 10, 69, 16, 53

Multiply. Check your work by going over it:

10.	48	56	83	26	219	123
	2	2	3	3	2	4
	96	112	249	78	438	492
11.	14	79	73	12	103	105
	3	3	2	6	8	3
	42	237	146	72	824	315

Do ex. 1, 2, 8, 9 orally. Urge pupils to respond quickly. More advanced pupils may do ex. 10–11 mentally also. Note errors on progress cards and group pupils for drill or reteaching.

Present multiple-choice objective test.

Which One Is Right?

Three answers are given below each question. Tell which answer is the right one:

1. Which one is the fourth month? April
December April February

2. Which one is shorter than a yard? 24 inches
4 feet 24 inches 40 inches

3. Which one is equal to a foot? 12 inches
36 inches 18 inches 12 inches

4. Which one is equal to a dollar? 4 quarters
4 quarters 75 cents 9 dimes

5. Which one is more than a quart? 4 pints
2 glasses 4 pints 1 pint

6. Which one is not equal to a yard? 18 inches
3 feet 36 inches 18 inches

7. Which one is equal to a dozen eggs? 12 eggs
6 eggs 12 eggs 18 eggs

8. Which one is longer than a foot? 19 inches
19 inches 10 inches 4 inches

9. Which one is equal to 5 dimes? half dollar
dollar half dollar quarter

10. Which one means twelve? XII
VII XII X

11. Which one is the largest piece of pie? ½ pie
$\frac{1}{2}$ pie $\frac{1}{3}$ pie $\frac{1}{4}$ pie

12. Which one makes more glasses of milk? 2 quarts
1 pint 2 pints 2 quarts

Main objective is to teach pupils how to work with this type of test. Do orally with class. Urge them to read questions carefully and be able to prove their answers.

Consult Guide for correlation of examples with aims.

Chapter Review

Multiply. Then add 1 to each answer:

1. 3 × 5 15, 16 9 × 2 18, 19 3 × 7 21, 22 8 × 1 8, 9 3 × 9 27, 28

2. 2 × 8 16, 17 6 × 3 18, 19 2 × 6 12, 13 3 × 3 9, 10 9 × 0 0, 1

3. 4 × 3 12, 13 7 × 0 0, 1 4 × 1 4, 5 9 × 3 27, 28 7 × 2 14, 15

4. Begin with 30 and count by 2's to 50.
30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50

5. Begin with 21 and count by 3's to 60.
21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60

Tell the number that goes in each space:

6. 6 × 3 = .18., so 3 × 6 = .18. Four 2's are .8.

7. 9 × 2 = .18., so 2 × 9 = .18. Seven 3's are .21.

8. 7 × 0 = .0., so 0 × 7 = .0. Three 8's are .24.

9. How many inches are there in 3 feet? 36 in 4 feet? 48

10. How many inches are there in 2 yards? 72 in 3 yards? 108

11. Write today's date. Give the month, day, and year.

12. Write the date one week later than June 11. June 18

Multiply. Check your work by going over it:

13.	18	36	29	406	225	108
	2	3	3	2	3	3
	36	108	87	812	675	324
14.	54	20	89	113	120	219
	3	7	2	5	4	3
	162	140	178	565	480	657
15.	98	33	77	240	103	110
	3	8	3	2	7	6
	294	264	231	480	721	660
16.	75	76	32	417	314	213
	3	2	6	2	3	4
	225	152	192	834	942	852

Observe pupils to note hesitancy or errors; record on progress cards. Let pupils who show mastery of skills and concepts work at arithmetic corner. Plan reteaching for others.

1. Jim bought 2 packages of stamps for his book. There were 135 stamps in each package. How many stamps did Jim buy? 270

2. In ex. 1 each package of stamps cost $.75. How much did Jim pay for 2 packages of stamps? $1.50

3. Bill also bought 2 packages of stamps. One of them cost $.65 and the other cost $1.25. How much did Bill pay for the stamps he bought? $1.90

4. Jim bought 270 stamps. Bill bought 300 stamps. How many more stamps did Bill buy than Jim? 30

5. Sally paid $1.50 for a basket for her bicycle. She also bought a bicycle light for $1.49. How much did Sally pay for both things? $2.99

6. In ex. 5 Sally gave the man $5.00 to pay for the basket and the light. How much change did she get? $2.01

7. Saturday Jack had 25 baskets of apples to sell. By supper time he had sold all but 4 baskets. How many baskets of apples had Jack sold? 21

8. At 2¢ each, find the cost of 8 stamps. 16¢

9. Ann sold 3 cakes for her mother. She got $.85 for each one. How much money did she get in all? $2.55

10. Ann's mother baked 3 large pans of cookies. There were 27 cookies in each pan. How many cookies were there all together? 81

Go back and look over your work. Try to get each answer right. In how many problems did you need to multiply to get the answer? Each problem counts 10.

Have pupils explain answers, telling how they knew whether to multiply, add, or subtract. Provide further work for pupils who have difficulty in recognizing thought patterns.

Present diagnostic test of multiplication skills.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Page for that row and do the examples on that page.

Copy and fill in the spaces:

		Practice Pages
1.	$6 \times 2 = \overset{12}{\ldots}$, so $2 \times 6 = \overset{12}{\ldots}$	205
2.	$4 \times 1 = \overset{4}{\ldots}$, so $1 \times 4 = \overset{4}{\ldots}$	212
3.	$8 \times 3 = \overset{24}{\ldots}$, so $3 \times 8 = \overset{24}{\ldots}$	221
4.	$6 \times 0 = \overset{0}{\ldots}$, so $0 \times 6 = \overset{0}{\ldots}$	229

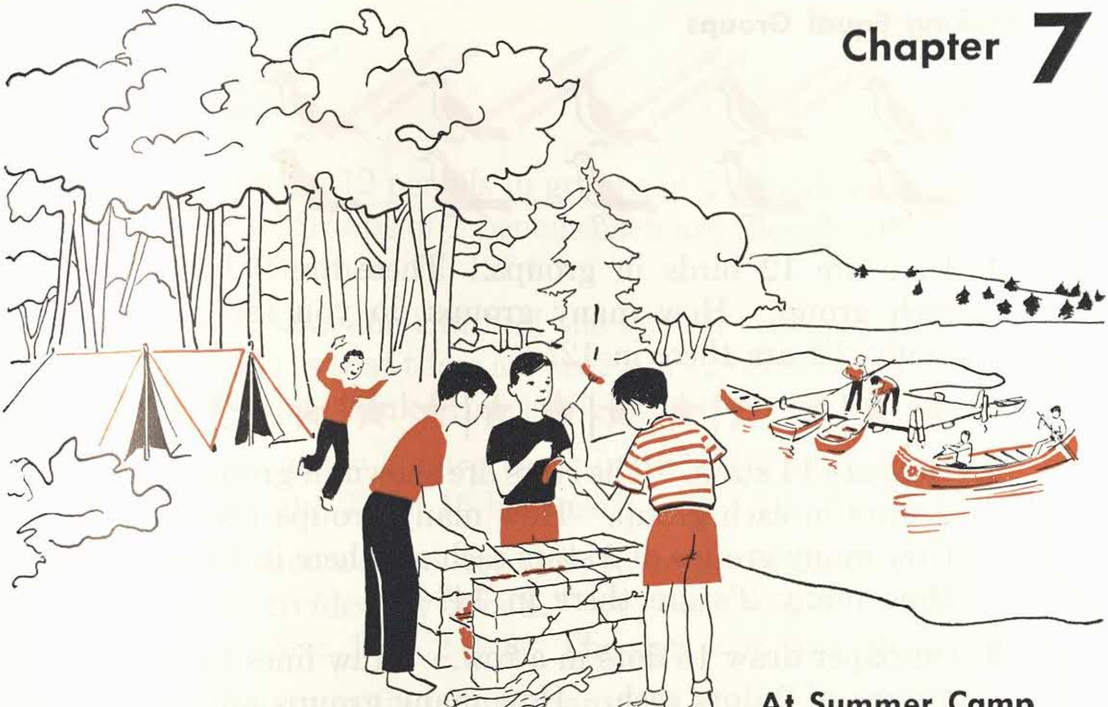
Multiply and check your work:

5.	32 2 64	41 2 82	83 2 166	314 2 628	231 2 462	211
6.	11 6 66	21 5 105	13 2 26	211 4 844	121 3 363	213
7.	$.24 2 $.48	$.11 7 $.77	$.22 3 $.66	$.64 2 $1.28	$.92 2 $1.84	215
8.	23 3 69	41 3 123	31 5 155	123 3 369	221 3 663	223
9.	25 2 50	24 3 72	39 2 78	16 3 48	25 3 75	224
10.	27 3 81	75 3 225	23 8 184	207 3 621	128 3 384	230
11.	$.68 3 $2.04	$.37 3 $1.11	$.29 3 $.87	$.13 7 $.91	$.19 3 $.57	230

Compare results of test with previous one (page 238) as noted on progress cards. Have pupils make self-assignments from practice pages. Work with them to reinforce understandings.

See Guide for specific aims of Chapter 7.

Chapter 7

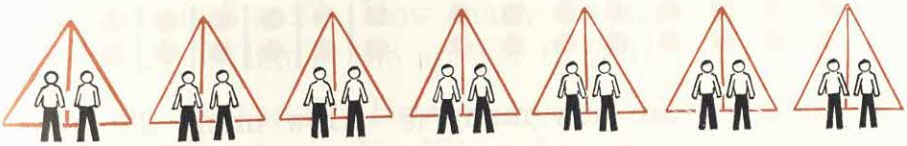


At Summer Camp

Prepare for division facts of the 2's (pages 241–242).

1. Last summer there were 14 young boys at Star Camp. Two boys lived in each tent. How many tents were there for the young boys? 7

▶ Look at the picture below. You see 14 boys standing by their tents. How many tents are there? 7 How many 2's make 14? 7

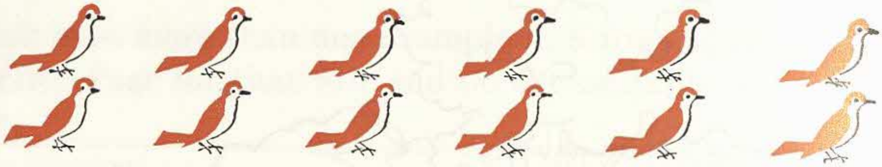


2. There were 18 older boys at the camp, too. How many tents did they need if 2 boys were in each tent? 9

▶ On paper draw a picture like the one under ex. 1. How many tents do 18 boys need? 9 How many 2's make 18? 9

In ex. 1–2, have pupils use materials to separate and count groups. Then have them make dot drawings to show groupings. In discussing results, use the phrase, "how many 2's make . . . ?"

Making Equal Groups



1. Here are 12 birds in groups. There are 2 birds in each group. How many groups do you see? 6 How many 2's are there in 12? 6

★ ★|★ ★|★ ★|★ ★|★ ★|★ ★|★ ★

2. Here are 14 stars. The stars are shown in groups with 2 stars in each group. How many groups are there? 7 How many groups of 2 stars each are there in 14 stars? 7 How many 2's are there in 14? 7

3. On paper draw 16 dots in a row. Draw lines to make groups of 2 dots each. How many groups are there? 8 How many 2's are there in 16? 8

4. Three 2's are how many? 6 How many 2's in 6? 3

5. Four 2's are how many? 8 How many 2's in 8? 4

6. Eight 2's are how many? 16 How many 2's in 16? 8

Tell the answers: Prove with counters or drawings.

7. Five 2's are 10, so there are . 5 . 2's in 10.

8. Nine 2's are . 18 ., so there are . 9 . 2's in 18.

9. Two 2's are . 4 ., so there are . 2 . 2's in 4.

As on page 241, let pupils use materials and dot drawings to separate and count groups. Have them tell number of dots in whole group, number in each equal group, number of groups, then "how many 2's in...?"

Establish relationships between division and subtraction.
Introduce words and symbols that indicate division.

How Many 2's?

1. Here are 12 pencils in groups of 2 pencils each. How many groups of 2 pencils each are there? 6 How many 2's are there in 12? 6

2. Ann says she can find the answer without a picture. She says that there are six 2's in 12 because $6 \times 2 = 12$. Do you think Ann is right? Yes

3. How many 2's are there in 16? 8 Joe says that there are eight 2's in 16 because $8 \times 2 = 16$. Is Joe right? Yes

4. Another way to say that there are eight 2's in 16 is: "16 divided by 2 is 8." A short way to write it is like this: $16 \div 2 = 8$. The sign ÷ means **divided by.**

5. When you find how many 2's there are in 16, you are **dividing.** $16 \div 2 = 8$ is a **division fact.**

6. A short way to write $16 \div 2 = 8$ is shown at the right. This short way is also read "16 divided by 2 is 8."

$$\begin{array}{r} 8 \\ 2\overline{)16} \end{array}$$

7. $2\overline{)10}$ means $10 \div 2$. It also means "How many 2's in 10?" What does $2\overline{)8}$ mean? "How many 2's in 8?" $2\overline{)14}$? "How many 2's in 14?"

8. What is 3×2? 6 How many 2's make 6? 3 What is $6 \div 2$? 3 What is the answer to $2\overline{)6}$? 3

9. What is 9×2? 18 How many 2's make 18? 9 What does $18 \div 2$ equal? 9 What does $2\overline{)18}$ equal? 9

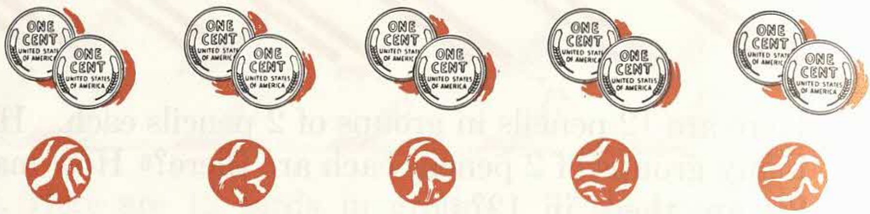
Tell the numbers that go in the spaces:

10. $8 \times 2 = 16$, so there are $\overset{8}{\ldots}$ 2's in 16.

11. $4 \times 2 = \overset{8}{\ldots}$, so there are $\overset{4}{\ldots}$ 2's in 8.

Reword problems on pages 241-242 saying "14 boys divided into groups of 2 are... groups," and so on. Use pupils to demonstrate answer by subtraction. Have pupils verify other facts by subtraction.

Learning to Divide



1. Marbles cost 2¢ each. How many marbles can you buy for 10¢? 5

▶ Look at the 10 pennies above. They are **divided** into groups of 2 pennies each. Each group of 2 pennies buys 1 marble. How many marbles do you see? 5 How many 2's are there in 10? 5

If you need help, draw pictures as in ex. 1: Use materials or dot drawings.

2. A stick of candy costs 2¢. How many sticks can Peter buy for 8¢? 4 What is $2\overline{)8}$? 4

3. How many 2-cent stamps can Susan buy for 18¢? 9 How many 2's are there in 18? 9 18 ÷ 2 = ? 9

4. Mr. Wood bought 16 birds to sell in his pet store. He put 2 birds in each cage. How many cages did he use? 8 What is $2\overline{)16}$? 8

5. A pencil costs 2¢. How many pencils can Jack buy for 6¢? 3 How many 2's are there in 6? 3

6. Ann picked 12 blue flowers in her garden. She put them in bunches with 2 flowers in each bunch. How many bunches of flowers did Ann make? 6

Tell the numbers that go in the spaces:

7. 9 × 2 = . 18 ., so 18 ÷ 2 = . 9 . .   . 9 . . 2's = 18

8. 7 × 2 = . 14 ., so 14 ÷ 2 = . 7 . .   . 7 . . 2's = 14

Stress relationship between division and multiplication, and division and subtraction. Have pupils express facts as: how many 2's in 10, 10 divided by 2, $2\overline{)10}$, 10 ÷ 2; and, there are five 2's in 10, 2 can be subtracted from 10 five times.

1. On pages 242–244 you divided numbers by 2. You found how many 2's there are in those numbers. Here are all the division facts for 2. Learn them. The first fact is read "2 divided by 2 is 1."

Build flash cards for following.

$\overset{1}{2\overline{)2}}$ $\overset{2}{2\overline{)4}}$ $\overset{3}{2\overline{)6}}$ $\overset{4}{2\overline{)8}}$ $\overset{5}{2\overline{)10}}$

$\overset{6}{2\overline{)12}}$ $\overset{7}{2\overline{)14}}$ $\overset{8}{2\overline{)16}}$ $\overset{9}{2\overline{)18}}$

2. Write the nine division facts in ex. 1 in another way, like this: $2 \div 2 = 1$, $4 \div 2 = 2$, and so on.

3. Read each of the division facts in ex. 1. Which division fact says that there are seven 2's in 14? The seventh Which fact tells how many 2's there are in 18? The ninth How many are there? 9 How many 2's are there in 10? 5

4. Which division fact in ex. 1 comes from $6 \times 2 = 12$? The sixth Which division fact comes from $8 \times 2 = 16$? The eighth

5. $6 \times 2 = \overset{12}{\ldots}$, so there are $\overset{6}{\ldots}$ 2's in 12.

6. $5 \times 2 = \overset{10}{\ldots}$, so there are $\overset{5}{\ldots}$ 2's in 10.

7. $7 \times 2 = \overset{14}{\ldots}$, so there are $\overset{7}{\ldots}$ 2's in 14.

8. If you forget the answer to a division fact like $14 \div 2$, ask yourself this question: How many 2's make 14? 7 $7 \times 2 = 14$ tells you that seven 2's are 14. So there are seven 2's in 14. Then you know that $14 \div 2 = 7$. Stress. The multiplication facts will help you to learn the division facts.

Have pupils give meanings as in ex. 7 of page 243.

9. Read these and give the answers:

$\overset{5}{2\overline{)10}}$ $\overset{9}{2\overline{)18}}$ $\overset{1}{2\overline{)2}}$ $\overset{7}{2\overline{)14}}$ $\overset{4}{2\overline{)8}}$ $\overset{6}{2\overline{)12}}$ $\overset{8}{2\overline{)16}}$

Have pupils check division facts by referring to corresponding multiplication fact and by subtraction. In ex. 1 lead pupils to see that dividends increase by 2 each time, answers by one more group of 2.

Provide word problems involving division facts of the 2's.

Painting Book Covers

1. Sally and Bill are painting book covers. They make 2 covers for each book. Sally has painted trees on 8 covers. For how many books has Sally painted covers? 4 How many 2's are there in 8? 4

2. Bill has painted animals on 10 covers. For how many books has Bill enough covers? 5 How many 2's are there in 10? 5 What is $2\overline{)10}$? 5

3. Last week the children painted flowers on 18 covers. These 18 covers can be used for how many books? 9 How many 2's are there in 18? 9

4. How many books can be made from 12 covers? 6 from 16 covers? 8 from 14 covers? 7

5. How many covers are needed for 3 books? 6

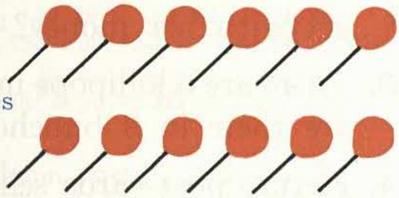
Have pupils use materials or drawings to help solve problems and verify answers by subtraction. Let pupils use facts in own problems for class to solve.

Introduce partition interpretation of division.

Finding One Half of a Number

1. On page 98 you learned how to find one half of a whole apple or a whole candy bar. You know that the two halves must be equal in size. You write one half apple like this: $\frac{1}{2}$ apple.

2. Now you will find one half of a group of things. Here are 12 lollipops. They are divided into 2 equal groups. How many lollipops are there in each group? 6 Are the groups equal in size? Yes When 12 lollipops are divided into 2 equal groups, each group is **one half** of 12 lollipops.



3. Suppose there were 7 lollipops in one group and 5 lollipops in the other group. Would the groups be equal in size? No Would each group be half of 12? No

4. You see that $\frac{1}{2}$ of 12 lollipops is 6 lollipops. Another way of writing "$\frac{1}{2}$ of 12" is $12 \div 2$. Here $12 \div 2$ means that 12 has been divided into 2 equal parts. To find $\frac{1}{2}$ of 12, you divide 12 by 2.

5. Put 6 play pennies one at a time into 2 equal groups. How many pennies are there in each group? 3 What is $\frac{1}{2}$ of 6 pennies? 3

Stress.

To find $\frac{1}{2}$ of a number, divide it by 2.

Find the answers to these: Let pupils use objects to demonstrate.

6. **$\frac{1}{2}$ of 8 birds** 4 birds **$\frac{1}{2}$ of 18 birds** 9 birds **$\frac{1}{2}$ of 10 birds** 5 birds

Review half of single object using materials (paper circles), stressing 2 equal parts. Then demonstrate that half of group of objects is same as dividing group into 2 equal parts, using pupils, books, discs.

Do You Multiply or Divide?

In each problem, first tell whether you multiply or divide to get the answer. Then tell the answer:

1. Joe had 12 candy eggs. He gave half of them to Alice. How many candy eggs did Alice get? Divide; 6

2. Mary has $8 to spend for books. The books Mary wants cost $2 each. How many books can Mary get with her money? Divide; 4

3. There are 6 lollipops in a bunch. How many lollipops are there in 3 bunches? Multiply; 18

4. Picture post cards sell at 2 for a nickel. How many cards can Jim buy with 5 nickels? Multiply; 10

5. Ann has 3 boxes of crayons. There are 8 crayons in each box. How many crayons has Ann all together? Multiply; 24

6. Dick and Bill earned $16. They divided the money equally. How much did each boy get? Divide; $8

7. Mother made 10 dozen cookies for the cake sale. She put 2 dozen cookies in each box. How many boxes of cookies did she have? Divide; 5

8. In the school play there were 7 pairs of children in a dance. How many children were in the dance? Multiply; 14

9. Tom made 14 toy animals. He made 2 of each kind. How many kinds of animals did Tom make? Divide; 7

10. Find the cost of 7 apples at 3¢ each. Multiply; 21¢

11. Mother bought 2 sweaters for Susan at $4 each. How much did she pay for both sweaters? Multiply; $8

12. Sally earned $4 last week. She put half of it in her bank. How much did Sally put in her bank? Divide; $2

Discuss problems with class orally. Have them give reasons why they divide or multiply. If necessary, let them use dot drawings to demonstrate process to be used.

Maintain addition and subtraction skills.

Review Practice

Tell the answers:

1. 16 + 6 22   24 + 5 29   39 + 6 45   28 + 2 30   53 + 9 62
2. 50 + 7 57   65 + 9 74   41 + 8 49   72 + 6 78   94 + 6 100
3. 47 + 4 51   83 + 5 88   35 + 7 42   48 + 6 54   26 + 8 34

Add 6 to each of these numbers; (1) add 7; (2) add 8; (3) add 9: (4)

(1), (2) 31, 32   58, 59   90, 91   72, 73   37, 38   61, 62   24, 25   81, 82
(3), (4) 4. 25 33, 34   52 60, 61   84 92, 93   66 74, 75   31 39, 40   55 63, 64   18 26, 27   75 83, 84

69, 70   80, 81   94, 95   35, 36   84, 85   42, 43   93, 94   98, 99
5. 63 71, 72   74 82, 83   88 96, 97   29 37, 38   78 86, 87   36 44, 45   87 95, 96   92 100, 101

Write the four numbers in a column, add, and check:

6. 37 + 34 + 66 + 55 192   42 + 31 + 18 + 87 178
7. 54 + 98 + 23 + 75 250   59 + 70 + 63 + 17 209
8. 89 + 23 + 74 + 48 234   36 + 36 + 79 + 24 175

9. The children in four rooms sold tickets for the school play. At the end of the first day they had sold 34 tickets, 29 tickets, 25 tickets, and 33 tickets. How many tickets had they sold the first day? 121

10. The children in ex. 9 had 500 tickets to sell. After the first day how many did they still have to sell? 379

Subtract these numbers. Check your work: Stress.

11.	695	147	363	429	120	535
	235	95	129	269	87	276
	460	52	234	160	33	259
12.	931	320	357	600	684	567
	255	13	342	375	545	180
	676	307	15	225	139	387
13.	800	779	578	178	308	934
	656	694	379	86	144	364
	144	85	199	92	164	570

Do ex. 1–5 orally, urging pupils to speed up responses.
Note hesitancy or errors in ex. 6–13 and plan for reteaching or extra practice.

Present problems dealing with addition and subtraction.

Problems about Spring

The children made these problems about spring. Can you find the answers?

1. Jim said, "On the way to school I saw 8 crows, 4 bluebirds, and 5 robins. How many birds is that?" 17
2. Ann asked, "How many little fish have I in this can? I had 25 but I left 8 of them at home in another can." 17
3. Peter said, "In January it got dark early. After school I played outdoors until half past 4. Now it is so light I can play outdoors until 6 o'clock. How much longer can I play outdoors now?" Look at the clock before you give your answer. 1:30, or 1 hour 30 minutes
4. Susan said, "I am watching the flowers in our garden. Yesterday there were only 11 flowers. Today I counted 28 flowers. How many more flowers are there today than yesterday?" 17
5. Mary said, "One year I planted a tree that was 23 inches high. Now it is 48 inches high. How many inches higher is the tree now than when I planted it?" 25
6. Jack said, "Tom and I went to Grandfather's farm. The postman brought 3 boxes of baby chickens. There were 25 chickens in each box. How many chickens did Grandfather get?" 75

Have pupils give reasons for adding or subtracting. Ask them why they could not multiply or divide in ex. 1–5 (unequal groups). Note if facts are causing difficulty and plan for drill. Have pupils make up similar problems.

Provide oral review of multiplication and division skills.

Oral Practice

1. Betty had a dime when she went to the store. She looked at some toys but spent nothing. How much money did Betty have left? 10¢

2. At 3¢ each, find the cost of 5 stamps; 15¢ of 9 stamps. 27¢

3. How many 2-cent stamps can you get for a dime? 5

4. Mary bought 3 bags of carrots. There were 8 carrots in each bag. How many carrots in all did she buy? 24

5. A quarter is equal to how many nickels? 5

6. How many feet are there in 6 yards? 18 in 4 yards? 12

7. How many pints are there in 8 quarts? 16 in 7? 14

8. Count by 2's to 30; by 3's to 30; by 5's to 30.

9. Add 5 to each of the numbers below:

   25 30 67 72 38 43 73 78 16 21 44 49 89 94 51 56

10. Add 8 to each number in ex. 9. (1) Add 6; (2) 7; (3) 9. (4) (1) 33, 75, 46, 81, 24, 52, 97, 59; (2) 31, 73, 44, 79, 22, 50, 95, 57; (3) 32, 74, 45, 80, 23, 51, 96, 58; (4) 34, 76, 47, 82, 25, 53, 98, 60

Tell the answers:

11. $\frac{1}{2}$ of 14 7 $7 + 9$ 16 $13 + 4$ 17 $8 \div 2$ 4
12. $\frac{1}{2}$ of 10 5 6×3 18 $12 - 9$ 3 2×7 14
13. $\frac{1}{2}$ of 18 9 $8 + 4$ 12 $16 \div 2$ 8 3×5 15
14. $\frac{1}{2}$ of 12 6 9×0 0 $15 - 6$ 9 $6 \div 2$ 3

Tell the numbers that go in the spaces:

15. $7 + 7 = 14$, so $7 + 8 =$. 15 .

16. $9 + 4$ is the same as $10 +$. 3 ., or . 13 .

17. The next two numbers after 999 are 1000. and 1001.

Be sure pupils understand signs in ex. 11-14. Let them make up similar activities, with different pupils acting as the teacher. Plan drill on facts if shown necessary.

Multiplication Review

1. Ann puts 10 candies in each box of candy she sells. How many candies must she make for 3 boxes? 30 for 4 boxes? 40 for 6 boxes? 60 for 9 boxes? 90 for 7 boxes? 70

2. Ann sells the candy at $.32 a box. How much does she get for 3 boxes? $.96 for 4 boxes? $1.28 for 6 boxes? $1.92

3. A bus ticket from Grand River to Blue Lake costs $1.03. Find the cost of 2 tickets; $2.06 of 3 tickets; $3.09 of 4 tickets. $4.12

Multiply. Check your work by going over it:

4.	86 2 172	95 3 285	12 7 84	33 4 132	227 2 454	112 5 560	309 3 927
5.	44 2 88	45 3 135	77 2 154	49 3 147	110 5 550	319 2 638	200 4 800
6.	34 3 102	12 8 96	15 2 30	97 3 291	317 3 951	306 3 918	236 2 472
7.	31 9 279	84 3 252	98 2 196	38 3 114	106 3 318	214 3 642	112 6 672
8.	18 3 54	22 5 110	20 9 180	17 2 34	227 3 681	426 2 852	126 3 378
9.	12 9 108	16 2 32	57 3 171	40 3 120	338 2 676	209 3 627	307 2 614

Multiply each number below by 2; (1) **by 3:** (2)

(1) 110 114 174 138 60 230 432

(2) **10.** 55 165 72 216 87 261 69 207 30 90 115 345 216 648

$6.50 $2.64 $4.08 $6.32 $8.56

11. $3.25 $9.75 $1.32 $3.96 $2.04 $6.12 $3.16 $9.48 $4.28 $12.84

Have pupils who seem to have difficulty explain their work. Note if errors are caused by facts, zeros, carrying, and so on. Regroup for reteaching.

Prepare for division facts of the 3's.

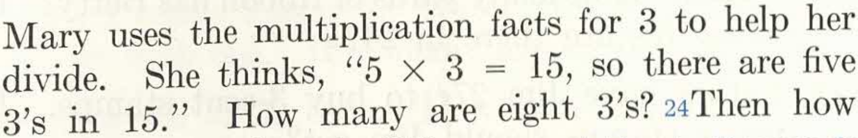
Making Equal Groups

1. Here are 12 pennies with 3 pennies in each group. How many groups do you see? 4 How many 3's are there in 12? 4

2. Here are 15 dots with 3 dots in each group. How many groups are there? 5 How many groups of 3 dots each are there in 15 dots? 5 How many 3's are there in 15? 5

3. On your paper draw a row of 21 dots. Draw lines to divide the dots into groups of 3 dots each. How many groups are there? 7 How many 3's are there in 21? 7

4. Three 3's are how many? 9 How many 3's in 9? 3



5. Six 3's are how many? 18 How many 3's in 18? 6

6. Mary uses the multiplication facts for 3 to help her divide. She thinks, "5 × 3 = 15, so there are five 3's in 15." How many are eight 3's? 24 Then how many 3's are there in 24? 8 Use own tables to discover facts.

Let pupils use materials to separate and count groups. Have them tell how many are in whole group, in each equal group, number of groups; then, "how many 3's in...?" See pages 241-242 for other suggestions.

Teach division facts of the 3's (pages 254–255).

How Many 3's?

1. Jack says there are nine 3's in 27 because 9 × 3 = 27. Is Jack right? Yes What is $3\overline{)27}$? 9

2. Suppose you do not know how many 3's there are in 24. Think, "How many 3's make 24?" You know that 8 × 3 = 24, so there are eight 3's in 24. What does $3\overline{)24}$ equal? 8 What is 24 ÷ 3? 8

Tell the numbers that go in the spaces: Have pupils give other facts not listed in ex. 3-9.

3. 2 × 3 = 6, so there are .2. 3's in 6.

4. .4. × 3 = 12, so there are .4. 3's in 12.

5. .8. × 3 = 24, so there are .8. 3's in 24.

6. .6. × 3 = 18, so there are .6. 3's in 18.

7. .9. × 3 = 27, so there are .9. 3's in 27.

8. .7. × 3 = 21, so there are .7. 3's in 21.

9. .5. × 3 = 15, so there are .5. 3's in 15.

Draw dots on paper if you need help with ex. 10–13:

10. Crayons cost 3¢ each. Bill has 15¢. How many crayons can he buy for 15¢? 5 How many 3's in 15? 5

11. Mother has 12 oranges. She uses 3 oranges for breakfast each day. How many days will 12 oranges last? 4 How many 3's are there in 12? 4

12. Betty has a roll of ribbon 24 feet long. 3 feet make 1 yard. How many yards of ribbon has Betty? 8 How many 3's are there in 24? 8

13. Father gave Jim 27¢ to buy 3-cent stamps. How many stamps should Jim get? 9

Stress relationship between division and multiplication by having pupils use own multiplication tables to discover and check facts in ex. 3–9. Have them express facts as: how many 3's in 6, 6 divided by 3, $3\overline{)6}$, 6 ÷ 3.

The 3's Facts in Division

Tell what numbers should be put in the spaces:

1. $\overset{6}{\ldots}$ 3's are 18 $\overset{9}{\ldots}$ 3's are 27 $\overset{3}{\ldots}$ 3's are 9

2. $\overset{8}{\ldots}$ 3's are 24 $\overset{5}{\ldots}$ 3's are 15 $\overset{2}{\ldots}$ 3's are 6

3. $\overset{4}{\ldots}$ 3's are 12 $\overset{7}{\ldots}$ 3's are 21 $\overset{9}{\ldots}$ 3's are 27

Tell the answers to these division facts:

4. $15 \div 3 =$ 5 $21 \div 3 =$ 7 $12 \div 3 =$ 4 $6 \div 3 =$ 2

5. $27 \div 3 =$ 9 $24 \div 3 =$ 8 $18 \div 3 =$ 6 $9 \div 3 =$ 3

6. $12 \div 3 =$ 4 $27 \div 3 =$ 9 $24 \div 3 =$ 8 $3 \div 3 =$ 1

7. Remember these division facts: Build flash cards.

$\begin{array}{r}1\\3\overline{)3}\end{array}$ $\begin{array}{r}2\\3\overline{)6}\end{array}$ $\begin{array}{r}3\\3\overline{)9}\end{array}$ $\begin{array}{r}4\\3\overline{)12}\end{array}$ $\begin{array}{r}5\\3\overline{)15}\end{array}$

$\begin{array}{r}6\\3\overline{)18}\end{array}$ $\begin{array}{r}7\\3\overline{)21}\end{array}$ $\begin{array}{r}8\\3\overline{)24}\end{array}$ $\begin{array}{r}9\\3\overline{)27}\end{array}$

8. Read each division fact in ex. 7. Tell the multiplication fact from which it comes. For example, $6 \div 3 = 2$ comes from $2 \times 3 = 6$.

9. Read these and give the answers:

$\begin{array}{r}6\\3\overline{)18}\end{array}$ $\begin{array}{r}8\\3\overline{)24}\end{array}$ $\begin{array}{r}3\\3\overline{)9}\end{array}$ $\begin{array}{r}5\\3\overline{)15}\end{array}$ $\begin{array}{r}7\\3\overline{)21}\end{array}$ $\begin{array}{r}2\\3\overline{)6}\end{array}$ $\begin{array}{r}9\\3\overline{)27}\end{array}$

10. In March Tom's music lessons cost \$15. Each lesson cost \$3. How many music lessons did Tom have? 5

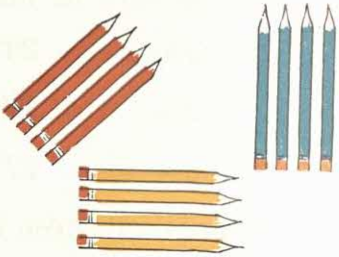
11. Sally's music lessons in March cost \$12. She pays \$3 for each one. How many lessons did Sally have? 4

12. Apples sell at 3¢ each. How many apples can Jim buy for 9¢? 3

Have pupils prove division facts in ex. 7 by subtraction. Have them express facts as: there are two 3's in 6, 3 can be subtracted from 6 two times. See page 245 for other suggestions.

Finding One Third of a Number

1. This pie is divided into 3 equal parts. Each part is **one third** of the whole pie. All 3 parts must be the same size. You write one third pie like this: $\frac{1}{3}$ pie.



2. Father bought a box of 12 pencils for Mary, Bill, and Jim. He divided them into 3 equal groups, as shown at the right. Each group is **one third** of 12 pencils. How many pencils are there in each group? 4 What is $\frac{1}{3}$ of 12 pencils? 4

3. Mary got $\frac{1}{3}$ of the pencils, Bill got $\frac{1}{3}$, and Jim got $\frac{1}{3}$. How many pencils did each child get? 4

4. What is $\frac{1}{3}$ of 12? 4 What is $12 \div 3$? 4 You see that $\frac{1}{3}$ of 12 is the same as $12 \div 3$.

Stress.

To find $\frac{1}{3}$ of a number, divide it by 3.

5. Use 18 play pennies for this. Hand them one at a time to 3 children. Count to 18 as you hand them out. How many pennies did each child get? 6 What is $\frac{1}{3}$ of 18¢? 6¢ What is $3\overline{)18}$? 6

Tell the answers:

6. $\frac{1}{3}$ of 27¢ 9¢ $\frac{1}{3}$ of 12¢ 4¢ $\frac{1}{3}$ of 9¢ 3¢ $\frac{1}{3}$ of 24¢ 8¢

7. $\frac{1}{3}$ of 21¢ 7¢ $\frac{1}{3}$ of 15¢ 5¢ $\frac{1}{3}$ of 3¢ 1¢ $\frac{1}{3}$ of 18¢ 6¢

Review one third of single object using materials (paper circles, flannel board), stressing 3 equal parts. Then demonstrate (using pupils, books, discs) that a third of group of objects is same as dividing group into 3 equal parts.

Using $\frac{1}{3}$ and $\frac{1}{2}$

1. Find $\frac{1}{3}$ of 12 marbles; 4 of 24 marbles; 8 of 15 marbles; 5 of 18; 6 of 6; 2 of 21; 7 of 9. 3

2. Find $\frac{1}{2}$ of 18 books; 9 of 14 books; 7 of 12 books; 6 of 10; 5 of 6; 3 of 16; 8 of 8; 4 of 4. 2

3. What is $\frac{1}{3}$ of 6 eggs? 2 of 18 eggs? 6 of 12 eggs? 4 of 3 eggs? 1 of 15? 5 of 9? 3 of 27? 9 of 21? 7

4. On your paper draw 12 dots, putting them one at a time into 2 equal groups. How many dots are in each group? 6 What is $\frac{1}{2}$ of 12 dots? 6

5. Draw 12 more dots, putting them one at a time into 3 equal groups. Each group is $\frac{1}{3}$ of the dots. What is $\frac{1}{3}$ of 12 dots? 4 dots

6. Which group has more dots, $\frac{1}{2}$ of 12 dots or $\frac{1}{3}$ of 12 dots? $\frac{1}{2}$ of 12 dots See ex. 4 and 5.

7. Which group is larger, $\frac{1}{2}$ of 18 apples or $\frac{1}{3}$ of 18 apples? $\frac{1}{2}$ of 18 Draw dots if you need help.

8. Which piece of pie is larger, $\frac{1}{2}$ pie or $\frac{1}{3}$ pie? $\frac{1}{2}$ Draw a picture if you do not know the answer.

9. Jim has 6 lollipops. If he divides them equally with Mary, how many lollipops will each one have? 3 If Jim divides the 6 lollipops equally with Mary and Betty, how many lollipops will each one have? 2

Tell the answers:

10. $\frac{1}{2}$ of 14 7 $\frac{1}{3}$ of 27 9 $\frac{1}{3}$ of 24 8 $\frac{1}{2}$ of 8 4

11. $\frac{1}{3}$ of 21 7 $\frac{1}{3}$ of 15 5 $\frac{1}{2}$ of 12 6 $\frac{1}{3}$ of 9 3

12. $\frac{1}{2}$ of 10 5 $\frac{1}{2}$ of 16 8 $\frac{1}{3}$ of 18 6 $\frac{1}{2}$ of 6 3

Do ex. 1–7 orally (use objects if needed). Develop concept that the larger the denominator of unit fraction, the smaller the quantity it represents. Use objects, fractional parts chart, fractional kits to demonstrate.

Teach division of 2-figure and 3-figure numbers by 2 and 3 without carrying or remainders (pages 258-259).

Dividing Larger Numbers

1. **Problem** Uncle Peter gave Bob and Dick 46 stamps to divide equally. How many stamps will each boy get? 23 What is $\frac{1}{2}$ of 46 stamps? 23 stamps

Explanation Think, "4 tens ÷ 2 = 2 tens." Write 2 over 4 tens. Think, "6 ones ÷ 2 = 3 ones." Write 3 over 6 ones. The answer is 23. Each boy gets 23 stamps.

$$\begin{array}{r|l} \text{Tens} & \text{Ones} \\ 2 & 3 \\ 2\overline{)4} & \overline{6} \end{array}$$

Check the work by multiplying 23 by 2. This gives 46, so the work is right.

2. Look at the examples below. Tell how each answer is found. Check the answers:

$$\begin{array}{r} 43 \\ 2\overline{)86} \end{array} \qquad \begin{array}{r} 13 \\ 3\overline{)39} \end{array} \qquad \begin{array}{r} 32 \\ 2\overline{)64} \end{array} \qquad \begin{array}{r} 14 \\ 2\overline{)28} \end{array} \qquad \begin{array}{r} 32 \\ 3\overline{)96} \end{array}$$

3. Three boys bought a package of 36 stamps. They divided the stamps equally. How many stamps did each boy get? 12

4. The boys in ex. 3 paid 69¢ for the package of stamps. They divided the cost equally. How many cents did each boy pay for his stamps? 23¢

Demonstrate ex. 1 on place-value pocket chart, showing 46 as 4 tens and 6 ones. Stress dividing tens first (putting answer in tens place) then ones. Do ex. 2-4 orally, to check this.

Relate checking process to that previously used in checking basic facts.

Dividing by 2 and 3

Divide. Check your work by multiplying:

1. $\overset{31}{2\overline{)62}}$ $\overset{44}{2\overline{)88}}$ $\overset{21}{3\overline{)63}}$ $\overset{22}{2\overline{)44}}$ $\overset{11}{3\overline{)33}}$ $\overset{13}{2\overline{)26}}$

2. $\overset{33}{3\overline{)99}}$ $\overset{12}{2\overline{)24}}$ $\overset{41}{2\overline{)82}}$ $\overset{22}{3\overline{)66}}$ $\overset{42}{2\overline{)84}}$ $\overset{33}{2\overline{)66}}$

3. $\overset{34}{2\overline{)68}}$ $\overset{23}{3\overline{)69}}$ $\overset{24}{2\overline{)48}}$ $\overset{11}{2\overline{)22}}$ $\overset{31}{3\overline{)93}}$ $\overset{21}{2\overline{)42}}$

4. **Problem** Mr. Green sold 288 eggs. He sold half of them to the Star Store. How many eggs did the Star Store buy? 144

Explanation Do the work as shown at the right. First divide 2 hundreds by 2. Then finish the work as you did on page 258.

$$\begin{array}{r|c|c}
\text{Hundreds} & \text{Tens} & \text{Ones} \\
1 & 4 & 4 \\
2\overline{)2} & 8 & 8
\end{array}$$

5. Look at the examples below. Tell how each answer is found. Check the answers:

$\overset{132}{3\overline{)396}}$ $\overset{432}{2\overline{)864}}$ $\overset{142}{2\overline{)284}}$ $\overset{323}{3\overline{)969}}$ $\overset{213}{3\overline{)639}}$

Divide. Check your work by multiplying: Stress.

6. $\overset{124}{2\overline{)248}}$ $\overset{423}{2\overline{)846}}$ $\overset{223}{2\overline{)446}}$ $\overset{442}{2\overline{)884}}$ $\overset{313}{2\overline{)626}}$ $\overset{141}{2\overline{)282}}$

7. $\overset{332}{3\overline{)996}}$ $\overset{221}{3\overline{)663}}$ $\overset{232}{3\overline{)696}}$ $\overset{131}{3\overline{)393}}$ $\overset{111}{3\overline{)333}}$ $\overset{223}{3\overline{)669}}$

8. $\overset{234}{2\overline{)468}}$ $\overset{342}{2\overline{)684}}$ $\overset{212}{3\overline{)636}}$ $\overset{343}{2\overline{)686}}$ $\overset{222}{3\overline{)666}}$ $\overset{221}{2\overline{)442}}$

9. $\overset{121}{3\overline{)363}}$ $\overset{422}{2\overline{)844}}$ $\overset{133}{3\overline{)399}}$ $\overset{331}{3\overline{)993}}$ $\overset{412}{2\overline{)824}}$ $\overset{113}{3\overline{)339}}$

10. $\overset{113}{2\overline{)226}}$ $\overset{333}{3\overline{)999}}$ $\overset{242}{2\overline{)484}}$ $\overset{322}{3\overline{)966}}$ $\overset{444}{2\overline{)888}}$ $\overset{324}{2\overline{)648}}$

11. $\overset{311}{3\overline{)933}}$ $\overset{132}{2\overline{)264}}$ $\overset{122}{3\overline{)366}}$ $\overset{331}{2\overline{)662}}$ $\overset{312}{3\overline{)936}}$ $\overset{414}{2\overline{)828}}$

Do ex. 1–3 orally to be sure pupils proceed in left-to-right direction. Use pocket chart to demonstrate ex. 4–5, stressing that dividing hundreds gives hundreds, tens gives tens, ones give ones.

Provide problem-solving experiences in addition and subtraction.

Circus Day

1. The circus came to town one day last summer. In the afternoon 450 people went to see it. At night 525 people were there. How many people went to the circus all together? 975

2. Bill liked the elephants best. He saw 8 large elephants and 5 small elephants. How many elephants did Bill see? 13

3. Susan liked the clowns best. She saw 4 clowns in little cars, 5 clowns on skates, and 8 clowns on bicycles. How many clowns did Susan see? 17

4. There were 8 clowns on bicycles. Then 3 clowns fell off. How many clowns were left on bicycles? 5

5. The circus had three rings. At one time there were 7 ponies in one ring, 5 ponies in another ring, and 7 ponies in the third ring. How many ponies were there in the three rings? 19

6. Bill and Susan spent 30¢ for peanuts for the elephants and 20¢ for ice cream. How much did they spend at the circus? 50¢

Remind pupils to read problems carefully to determine what the problem asks them to do, facts known, process to use. Ask them to pick out key phrases which help them to know whether to add or subtract.

The Gallon

1. For Mary's party Mother bought a $\frac{1}{2}$-gallon package of ice cream. Mary asked, "What does gallon mean?" Mother told her that there are 4 quarts in 1 gallon.

2. Mother let Mary take a gallon can and a quart bottle so that she could see that 4 quarts equal 1 gallon. Mary filled the quart bottle with water. She poured it into the gallon can. She did this 4 times in all and the water just filled the gallon can. How many quarts make 1 gallon?

3. How many quarts are there in $\frac{1}{2}$ gallon? 2

4. Can you name something your father buys for the car that is measured by the gallon? Gasoline

5. Name something else that is sold by the gallon.

6. How many pints are there in 1 quart? 2 How many pints are there in 1 gallon? 8 in 2 gallons? 16

7. Remember this:

4 quarts = 1 gallon

Tell the numbers to put in the spaces:

8. 3 quarts = . . 6 . pints   1 gallon = . . 4 . quarts

9. 1 quart = . . 4 . glasses   8 pints = . . 4 . quarts

10. 8 glasses = . . 4 . pints   3 gallons = . . 12 . quarts

11. 4 quarts = . . 8 . pints   6 pints = . . 3 . quarts

Review equivalences of cup, pint, quart. Display these and gallon jug, $\frac{1}{2}$-gallon milk container, 5-gallon can. Discuss and list things bought by gallon and $\frac{1}{2}$ gallon. Demonstrate new equivalences. See Guide for estimation procedure.

Teach important problem pattern in division.

How Many Can You Buy?

1. Jane has 12¢ to spend for cakes. Small cakes cost 2¢ each. How many can Jane buy? 6

2. Larger cakes cost 3¢ each. How many larger cakes can Jane buy with 12¢? 4

3. Jack has 9¢. How many pencils at 3¢ each can Jack buy for 9¢? 3

4. Ann has 15¢ to spend for apples. How many apples can she buy if 1 apple costs 3¢? 5

5. Bob has 27¢ to spend for marbles at 3¢ each. How many marbles can Bob buy? 9

6. Susan's father gave her 10¢ to buy 2-cent stamps. How many stamps should Susan get? 5

7. Betty got $6 for Christmas. She wants to buy books that cost $2 each. How many books can she buy? 3

8. Paper hats cost 3¢ each. How many of these hats can I buy for 24¢? 8

9. How many 2-cent pencils can Jim buy with 8¢? 4

10. How many 3-cent stamps can Mary buy with 18¢? 6

Emphasize.

Suppose you know the cost of one thing and how much money you can spend. You divide to find how many of these things you can buy.

This pattern represents measurement concept in division. Reinforce by having pupils make up and illustrate original problems. Post on bulletin board for reference.

Stress.

Multiply inside the ( ) first and then add:

1. (3 × 5) + 2 = 17 (6 × 3) + 1 = 19 (2 × 8) + 1 = 17

2. (2 × 9) + 1 = 19 (3 × 9) + 2 = 29 (6 × 2) + 1 = 13

3. (3 × 8) + 2 = 26 (7 × 2) + 2 = 16 (3 × 7) + 1 = 22

Multiply each number by 2;(1) **multiply each number by 3:**(2)

	(1) 252	434	214	420	658
4.	126 (2) 378	217 651	107 321	210 630	329 987
	630	418	600	248	260
5.	315 945	209 627	300 900	124 372	130 390

6. Dick has a new stamp book. Uncle Joe gave Dick 2 packages of stamps for his book. There were 125 stamps in each package. How many stamps did Dick get all together? 250

7. Uncle Joe paid $.85 for each package of stamps. How much did he pay for the 2 packages? $1.70

Multiply. Check your work by going over it:

8.	239	125	318	417	306	224
	2	3	3	2	2	3
	478	375	954	834	612	672
9.	321	102	245	309	213	318
	3	8	2	3	4	2
	963	816	490	927	852	636
10.	103	206	317	113	235	112
	9	3	3	6	2	5
	927	618	951	678	470	560
11.	106	103	129	115	100	425
	2	7	3	3	8	2
	212	721	387	345	800	850

More Practice. See ㊲ on page 325.

Do ex. 1–3 orally, urging pupils to answer quickly. Observe pupils as they work to note difficulties with process or basic facts. Drill or reteach as needed.

Teach division of 3-figure numbers when quotient is offset.

Grandfather's Chickens

1. Problem This year Grandfather bought 126 baby chickens. He bought $\frac{1}{2}$ of them in April. How many baby chickens did he buy in April? 63

Explanation To find out, you must divide 126 by 2.

You cannot divide 1 hundred by 2 without changing 1 hundred to 10 tens. 10 tens + 2 tens = 12 tens. You can now divide 12 tens by 2. Think, "12 tens ÷ 2 = 6 tens." Write 6 over the 2 of 12 to show that you have divided 12 tens.

$$2\overline{)126}^{\;63}$$

Think, "6 ones ÷ 2 = 3 ones." Write 3 over 6 ones. The answer is 63. Grandfather bought 63 baby chickens in April. To check your work, multiply 63 by 2. If you get 126, your answer is right.

Check

$$\begin{array}{r} 63 \\ \times 2 \\ \hline 126 \end{array}$$

2. Grandfather said that $\frac{1}{3}$ of the 126 baby chickens were white. How many white chickens were there? 42

3. Grandfather sells eggs to a store. One week he got 168 eggs from his hens. He sold $\frac{1}{2}$ of them to the store. How many eggs did he sell to the store? 84

4. Grandfather told Bill that 84 eggs are the same as 7 dozen eggs. Bill multiplied two numbers and found that Grandfather was right. What numbers did he multiply? 12 (eggs) and 7 (dozen)

Use pocket chart to demonstrate ex. 4, to show that 1 hundred cannot be divided by 2; therefore it is changed to 10 tens and added to 2 tens to make 12 tens. Therefore, 6 must be placed in tens place, since tens were divided.

Maintain division skill; give further practice with offset quotients and partition division.

Dividing Numbers

1. To find $\frac{1}{2}$ of a number, I divide the number by ... 2

2. To find $\frac{1}{3}$ of a number, I divide the number by ... 3

Tell the answers:

3. $\frac{1}{2}$ of 12 6 $\quad$ $\frac{1}{3}$ of 27 9 $\quad$ $\frac{1}{2}$ of 24 12 $\quad$ $\frac{1}{3}$ of 39 13

4. $\frac{1}{3}$ of 15 5 $\quad$ $\frac{1}{3}$ of 21 7 $\quad$ $\frac{1}{2}$ of 46 23 $\quad$ $\frac{1}{2}$ of 66 33

5. $\frac{1}{3}$ of 24 8 $\quad$ $\frac{1}{2}$ of 18 9 $\quad$ $\frac{1}{3}$ of 18 6 $\quad$ $\frac{1}{2}$ of 14 7

6. $\frac{1}{2}$ of 16 8 $\quad$ $\frac{1}{2}$ of 10 5 $\quad$ $\frac{1}{3}$ of 33 11 $\quad$ $\frac{1}{3}$ of 69 23

In ex. 7-16 stress that division of tens gives tens, ones gives ones.

Divide these numbers. Check your work by multiplying:

7. $\begin{array}{r}51\\2\overline{)102}\end{array}$ $\quad$ $\begin{array}{r}62\\3\overline{)186}\end{array}$ $\quad$ $\begin{array}{r}41\\3\overline{)123}\end{array}$ $\quad$ $\begin{array}{r}71\\2\overline{)142}\end{array}$ $\quad$ $\begin{array}{r}92\\3\overline{)276}\end{array}$

8. $\begin{array}{r}84\\2\overline{)168}\end{array}$ $\quad$ $\begin{array}{r}72\\2\overline{)144}\end{array}$ $\quad$ $\begin{array}{r}72\\3\overline{)216}\end{array}$ $\quad$ $\begin{array}{r}43\\3\overline{)129}\end{array}$ $\quad$ $\begin{array}{r}82\\2\overline{)164}\end{array}$

9. $\begin{array}{r}82\\3\overline{)246}\end{array}$ $\quad$ $\begin{array}{r}63\\3\overline{)189}\end{array}$ $\quad$ $\begin{array}{r}64\\2\overline{)128}\end{array}$ $\quad$ $\begin{array}{r}52\\3\overline{)156}\end{array}$ $\quad$ $\begin{array}{r}94\\2\overline{)188}\end{array}$

10. $\begin{array}{r}51\\3\overline{)153}\end{array}$ $\quad$ $\begin{array}{r}54\\2\overline{)108}\end{array}$ $\quad$ $\begin{array}{r}93\\3\overline{)279}\end{array}$ $\quad$ $\begin{array}{r}71\\3\overline{)213}\end{array}$ $\quad$ $\begin{array}{r}63\\2\overline{)126}\end{array}$

11. Jack gave Tom $\frac{1}{3}$ of 96 stamps. How many stamps did Tom get? 32

12. Mary saved $\frac{1}{2}$ of the \$28 she earned last summer. How many dollars did Mary save? \$14

Have pupils use $\overline{)}$ sign.

Find the answers. Check your work by multiplying:

13. $\frac{1}{3}$ of 99 33 $\quad$ $\frac{1}{3}$ of 243 81 $\quad$ $\frac{1}{2}$ of 124 62 $\quad$ $\frac{1}{3}$ of 126 42

14. $\frac{1}{2}$ of 84 42 $\quad$ $\frac{1}{3}$ of 159 53 $\quad$ $\frac{1}{2}$ of 106 53 $\quad$ $\frac{1}{3}$ of 183 61

15. $\frac{1}{2}$ of 68 34 $\quad$ $\frac{1}{2}$ of 166 83 $\quad$ $\frac{1}{3}$ of 219 73 $\quad$ $\frac{1}{2}$ of 162 81

16. $\frac{1}{3}$ of 66 22 $\quad$ $\frac{1}{2}$ of 182 91 $\quad$ $\frac{1}{3}$ of 273 91 $\quad$ $\frac{1}{3}$ of 249 83

Use pocket chart to demonstrate some examples. Be sure pupils use proper direction and place quotient figures correctly. Have them explain work as in ex. 1, page 264.

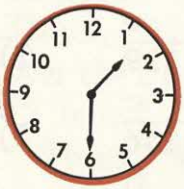
Teach meaning of A.M. and P.M.; reteach terms "before" and "past" the hour.

Telling Time

1. Noon comes at 12 o'clock. 9 A.M. means 9 o'clock in the morning. A.M. means **before noon.** 2 P.M. means 2 o'clock in the afternoon. P.M. means **after noon.** What does 6 A.M. mean? 6 o'clock in the morning

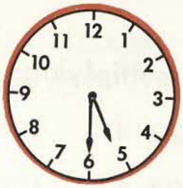
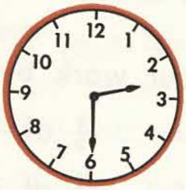
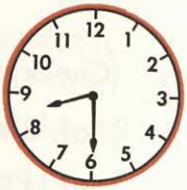
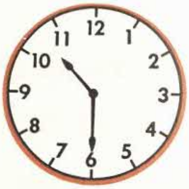
2. You know it takes the long hand of the clock 5 minutes to move from 12 to 1, from 1 to 2, and so on. Begin with 1 and point to each number around the clock as you count the minutes by 5's. How many minutes does it take the long hand to move all around the face of the clock? 60 How many minutes equal 1 hour? 60

3. From 6 P.M. to 7 P.M. is how many minutes? 60 From 9 A.M. to 10 A.M. is how many minutes? 60



4. This clock shows 30 minutes past 1, or **half past** 1. It means a half hour after 1. A half hour is how many minutes? 30 A short way to write 30 minutes past 1 is 1:30. You read it "one thirty." How many minutes does it take the long hand of the clock to move halfway around the face of the clock? 30

5. Tell the time by each clock. Say it in two different ways. Then write these times in the short way:

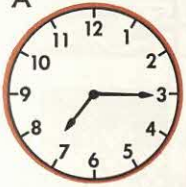
6. Use a toy clock for this exercise, or draw a clock on the blackboard. Place the hands to show 4:30; 9:30; 12:30; 6:30; 7:30; 11:30.

Use clocks made previously (pages 106–107) in reteaching "before" and "past," and developing "half past." Give practice in use of A.M. and P.M. by having pupils write times of favorite television programs.

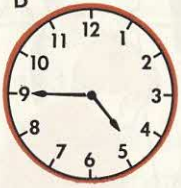
Continue reading of clocks to 5-minute intervals.

7. Clock A below shows 15 minutes past 7, or 7:15. 7:15 is read "seven fifteen." You often call it a **quarter after** 7 because the long hand has gone a quarter of the way around the clock.

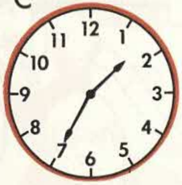
A



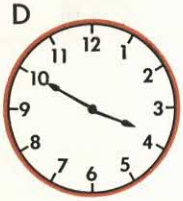
B



C



D



8. Clock B above shows 4:45. You read it "four forty-five." 4:45 is 15 minutes before 5. So you often call it "15 minutes to 5" or "a quarter to 5." A quarter of an hour is the same as 15 minutes.

9. Clock C above shows 1:35, or 25 minutes to 2. What time does clock D show? 10 minutes to 4

10. Use a toy clock for this exercise. Place the clock hands to show these times: 7:20; 8:10; 1:40; 3:15; 2:05; 10:45; 5:35. If you do not have a toy clock, draw a clock face on the blackboard.

Look at the clock in your room at school or at the toy clock. Then answer these questions:

11. How many minutes does the long hand take to go from 1 to 3 on the clock? 10 from 12 to 4 on the clock? 20

12. How many minutes does the long hand take to go from 10 to 2 on the clock? 20 from 9 to 4? 35

13. Learn this:

Emphasize.

60 minutes = 1 hour

Have pupils use own clocks to show times of various school activities. Give pupils similar, but abbreviated, activities on everyday basis.

Present word problems dealing with all four operations.

Buying Spot

1. Spot is the dog the Brown children want to buy. His price is \$24. Father will pay $\frac{1}{2}$ of the cost and the children will pay $\frac{1}{2}$. How much will the children have to pay? \$12

2. Bob Brown has saved \$3.15, Dick has saved \$2.90, and Sally has saved \$3.33. How much money have the three children saved? \$9.38 Have they enough money to pay their half of the cost of the dog? \$9.38; no

3. How much more money do the children need to earn to make \$12.00 in all? \$2.62 In doing this problem, use the answer to ex. 2.

4. Suppose each one of the Brown children earns \$.90 next week. \$2.70 How much money in all will they earn next week? They need \$2.62. Will they have enough money? Yes Will any money be left? Yes If so, how much? \$.08

Have pupils do problems orally, giving reasons for using process selected. Have them make up other problems for class to solve.

Write these numbers in columns, add, and check:

1. 64 + 78 + 67 + 43 252 　 38 + 17 + 83 + 22 160

2. 82 + 23 + 65 + 36 206 　 43 + 62 + 58 + 27 190

3. 17 + 88 + 86 + 33 224 　 79 + 57 + 78 + 21 235

4. On four days this week Joe sold 49 papers, 60 papers, 41 papers, and 52 papers. How many papers in all did Joe sell in four days? 202

5. Susan earned 75¢, 35¢, 60¢, and 85¢ in the last four weeks. How much did Susan earn all together? $2.55

Add and check your work: Stress checking.

6.	73	58	36	94	42	92	95
	88	44	59	56	68	96	39
	34	63	53	65	94	27	88
	42	56	69	15	77	48	25
	237	221	217	230	281	263	247

7. Peter had $5.00. He bought a sweater for $3.89. How much change did he get? $1.11

8. Peggy had 50 tickets to sell. Now she has only 19 tickets left. How many tickets has Peggy sold? 31

Subtract. Check your work by adding: Stress.

9.	859	470	628	496	592	405
	686	236	249	326	365	146
	173	234	379	170	227	259
10.	906	553	641	800	584	637
	408	196	527	94	496	583
	498	357	114	706	88	54
11.	900	302	685	477	678	700
	255	106	204	387	153	437
	645	196	481	90	525	263

Remind pupils to check column addition by reversing direction. Let pupils who hesitate explain their work, to check understanding. Give more practice if needed.

Present important problem pattern in division.

Sharing Things

1. Jack and Bill caught 10 fish. They divided the fish equally between them. To divide 10 fish **equally** between 2 boys means that each boy should have the same number of fish. So Jack and Bill each got $\frac{1}{2}$ of the fish. How many fish did each boy get? 5

2. Three boys caught 18 fish. They shared the fish **equally.** How many fish did each boy get? 6
▶ To **share equally** means to **divide equally.** Each boy's share was $\frac{1}{3}$ of 18 fish. How many fish did each boy get? 6

Stress and have pupils demonstrate in own problems.

Suppose things are shared equally by a number of children. You find each child's share by dividing by the number of children.

3. Mary and Alice paid 68¢ for a plant for their mother. They shared the cost equally. What was each girl's share of the cost? 34¢

4. Three boys bought a tent for $24. They shared the cost equally. How much did each boy pay? $8

5. Ann and Susan picked 24 roses. They shared the flowers equally. How many roses did each girl get? 12

6. Last week Uncle Bill gave $15 to Jane. He told her to share the money equally with Dick and Sally. What was each child's share of the money? $5

7. Betty bought 12 pencils. She shared them equally with her sister. How many pencils did each girl get? 6

Demonstrate new pattern first in classroom situations (sharing crayons, toy money, and so on, equally). Be sure pupils see that to share equally or to divide equally means that each one must receive same number of things or amount of money.

Lead pupils to understand the generalization and how it can be verified by multiplication, e.g. 0 ÷ 5 = 0, 5 x 0 = 0.

Using Zero in Division

1. Jim had 6 lollipops. He shared them equally with Bill. How many lollipops did Jim give Bill? 3 What is 6 ÷ 2? 3

2. Jim has 0 apples. 0 is called **zero** and means **not any** or **none.** 0 apples means Jim has **no** apples. If Jim shares 0 apples with Bill, how many apples will Bill get? 0 What is 0 ÷ 2? 0

3. You see that 0 ÷ 2 = 0. Another way to write 0 ÷ 2 = 0 is shown at the right.

$$\begin{array}{r}0\\2\overline{)0}\end{array}$$

4. How much is $\overset{0}{6\overline{)0}}$? $\overset{0}{8\overline{)0}}$? $\overset{0}{5\overline{)0}}$? You see that the answer is 0 in each of these division examples. Stress.

Emphasize.

0 divided by any other number = 0.

5. **Problem** Peter bought 120 marbles. He gave half of them to Tom. How many marbles did Tom get? 60 (Demonstrate with pocket chart.)

$$\begin{array}{r}60\\2\overline{)120}\end{array}$$

Explanation Think, "12 ÷ 2 = 6." Write 6 over 2. Think, "0 ÷ 2 = 0." Write 0 over 0. The answer is 60. Tom got 60 marbles. To check the work, multiply 60 by 2.

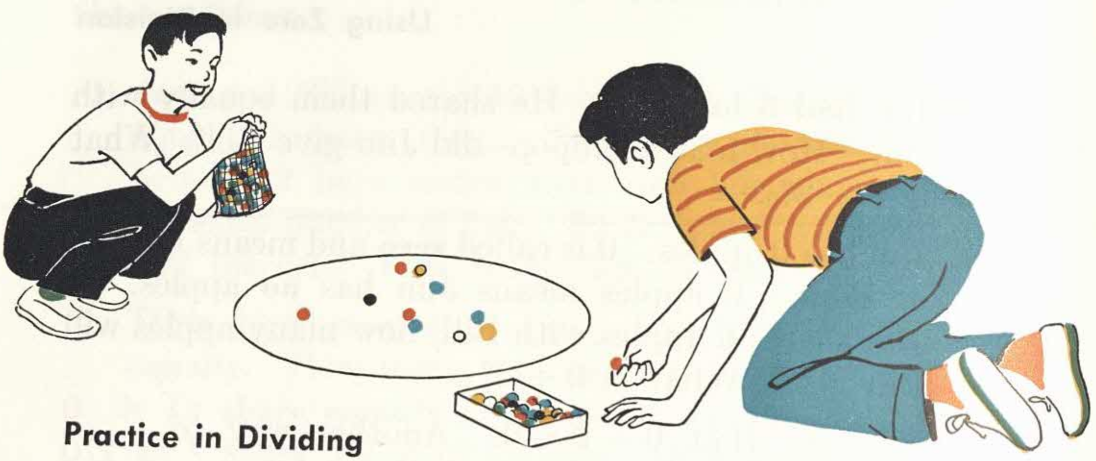
6. Alice earned 80¢. She saved half of it. How much money did Alice save? 40¢

7. Father gave Bob 60¢ to buy 3-cent stamps. How many stamps should Bob get? 20

8. Mary paid 90¢ for 3 tickets to the movies. How much did each ticket cost? 30¢

Follow carefully development in ex. 1-4. Show that we can write two division facts from multiplication facts without zeros, e.g. 4 x 2 = 8, 8 ÷ 2 = 4, 8 ÷ 4 = 2: but that only one division fact is related to such a fact as 6 x 0 = 0, since we do not divide by 0.

Extend work with 1-figure divisors to include 0's in dividend.



Practice in Dividing

1. Jim and Dick bought 40 marbles in a bag. They shared the marbles equally. How many marbles did each boy get? 20

2. The bag of marbles in ex. 1 cost 68¢. The 2 boys shared the cost of the marbles also. How much did each boy pay? 34¢

3. Jim and Dick are saving to buy a large bag of marbles. There are 88 marbles in it. How many marbles will each boy get if they share the marbles equally? 44

Divide each number by 2. (1) **Then divide each one by 3:** (2)

4. (1) $\overset{30}{60}$ (2) 20 $\overset{90}{180}$ 60 $\overset{60}{120}$ 40 $\overset{300}{600}$ 200 $\overset{93}{186}$ 62 $\overset{63}{126}$ 42

5. $\overset{33}{66}$ 22 $\overset{330}{660}$ 220 $\overset{303}{606}$ 202 $\overset{120}{240}$ 80 $\overset{333}{666}$ 222 $\overset{123}{246}$ 82

Divide. Check your work by multiplying: Do some orally.

6. $2\overline{)160}^{\,80}$ $3\overline{)150}^{\,50}$ $3\overline{)306}^{\,102}$ $2\overline{)804}^{\,402}$ $3\overline{)300}^{\,100}$

7. $3\overline{)603}^{\,201}$ $2\overline{)106}^{\,53}$ $3\overline{)210}^{\,70}$ $2\overline{)140}^{\,70}$ $3\overline{)216}^{\,72}$

8. $3\overline{)156}^{\,52}$ $3\overline{)900}^{\,300}$ $2\overline{)808}^{\,404}$ $3\overline{)159}^{\,53}$ $2\overline{)400}^{\,200}$

Emphasize place-holding nature of zero (needed to keep hundreds and tens in proper places). Use pocket chart to demonstrate.
Stress that dividing hundreds gives hundreds, and so on.
Be sure quotient is placed correctly.

Present comprehensive review of multiplication and division work.

Review

Multiply each number by 2.(1) Then multiply each by 3:(2)

(1) 1. $\overset{438}{219}$ (2) 657 $\overset{656}{328}$ 984 $\overset{218}{109}$ 327 $\overset{250}{125}$ 375 $\overset{628}{314}$ 942 $\overset{254}{127}$ 381

2. $\overset{246}{123}$ 369 $\overset{414}{207}$ 621 $\overset{630}{315}$ 945 $\overset{460}{230}$ 690 $\overset{452}{226}$ 678 $\overset{616}{308}$ 924

3. What is the product of 3 and 204? 612

4. Dick can save $1.10 each week. How much money will he have at the end of 5 weeks? $5.50

Multiply. Check by going over your work:

5.	446	124	218	138	102	223
	2	3	3	2	6	4
	892	372	654	276	612	892
6.	116	249	107	113	103	307
	3	2	3	7	9	2
	348	498	321	791	927	614

Find one half of each of these numbers:

7. 264 132 426 213 184 92 108 54 166 83 128 64

8. 222 111 148 74 102 51 162 81 124 62 146 73

Find one third of each of these numbers:

9. 129 43 153 51 183 61 276 92 213 71 243 81

10. 663 221 273 91 189 63 123 41 219 73 369 123

11. The children in 3 rooms shared 96 new music books equally. How many music books did each room get? 32

Divide. Check your work by multiplying:

12. $3\overset{233}{\overline{)699}}$ $2\overset{72}{\overline{)144}}$ $2\overset{52}{\overline{)104}}$ $3\overset{61}{\overline{)183}}$ $3\overset{131}{\overline{)393}}$

13. $2\overset{94}{\overline{)188}}$ $3\overset{93}{\overline{)279}}$ $2\overset{134}{\overline{)268}}$ $3\overset{331}{\overline{)993}}$ $2\overset{411}{\overline{)822}}$

This page should be completed by all pupils, as check of areas of weakness. Plan now for reteaching based on class or individual needs. Let other pupils work at arithmetic corner.

Give oral practice in multiplication and division facts.

Multiplication Facts You Should Know

You have learned these multiplication facts. Give the answers as quickly as you can:

1.	$\begin{array}{r}3\\ \underline{2}\\ 6\end{array}$	$\begin{array}{r}5\\ \underline{3}\\ 15\end{array}$	$\begin{array}{r}2\\ \underline{7}\\ 14\end{array}$	$\begin{array}{r}3\\ \underline{3}\\ 9\end{array}$	$\begin{array}{r}2\\ \underline{4}\\ 8\end{array}$	$\begin{array}{r}9\\ \underline{2}\\ 18\end{array}$	$\begin{array}{r}0\\ \underline{3}\\ 0\end{array}$	$\begin{array}{r}1\\ \underline{2}\\ 2\end{array}$	$\begin{array}{r}2\\ \underline{6}\\ 12\end{array}$
2.	$\begin{array}{r}5\\ \underline{2}\\ 10\end{array}$	$\begin{array}{r}3\\ \underline{6}\\ 18\end{array}$	$\begin{array}{r}2\\ \underline{0}\\ 0\end{array}$	$\begin{array}{r}3\\ \underline{4}\\ 12\end{array}$	$\begin{array}{r}3\\ \underline{1}\\ 3\end{array}$	$\begin{array}{r}2\\ \underline{2}\\ 4\end{array}$	$\begin{array}{r}7\\ \underline{3}\\ 21\end{array}$	$\begin{array}{r}3\\ \underline{9}\\ 27\end{array}$	$\begin{array}{r}2\\ \underline{8}\\ 16\end{array}$
3.	$\begin{array}{r}2\\ \underline{1}\\ 2\end{array}$	$\begin{array}{r}3\\ \underline{0}\\ 0\end{array}$	$\begin{array}{r}2\\ \underline{9}\\ 18\end{array}$	$\begin{array}{r}6\\ \underline{2}\\ 12\end{array}$	$\begin{array}{r}3\\ \underline{7}\\ 21\end{array}$	$\begin{array}{r}9\\ \underline{3}\\ 27\end{array}$	$\begin{array}{r}2\\ \underline{5}\\ 10\end{array}$	$\begin{array}{r}3\\ \underline{8}\\ 24\end{array}$	$\begin{array}{r}6\\ \underline{3}\\ 18\end{array}$
4.	$\begin{array}{r}4\\ \underline{2}\\ 8\end{array}$	$\begin{array}{r}3\\ \underline{5}\\ 15\end{array}$	$\begin{array}{r}8\\ \underline{2}\\ 16\end{array}$	$\begin{array}{r}2\\ \underline{3}\\ 6\end{array}$	$\begin{array}{r}8\\ \underline{3}\\ 24\end{array}$	$\begin{array}{r}7\\ \underline{2}\\ 14\end{array}$	$\begin{array}{r}1\\ \underline{3}\\ 3\end{array}$	$\begin{array}{r}0\\ \underline{2}\\ 0\end{array}$	$\begin{array}{r}4\\ \underline{3}\\ 17\end{array}$

Any number × 0 = 0. Any number × 1 = the number.

Emphasize.

If you forget the answer to a multiplication fact, reverse the numbers. Then try to multiply them.

Division Facts You Should Know

You have learned these division facts. Give the answers as quickly as you can:

5.	$\begin{array}{r}1\\ 2\overline{)2}\end{array}$	$\begin{array}{r}2\\ 3\overline{)6}\end{array}$	$\begin{array}{r}4\\ 2\overline{)8}\end{array}$	$\begin{array}{r}6\\ 2\overline{)12}\end{array}$	$\begin{array}{r}9\\ 3\overline{)27}\end{array}$
6.	$\begin{array}{r}0\\ 3\overline{)0}\end{array}$	$\begin{array}{r}2\\ 2\overline{)4}\end{array}$	$\begin{array}{r}6\\ 3\overline{)18}\end{array}$	$\begin{array}{r}8\\ 2\overline{)16}\end{array}$	$\begin{array}{r}5\\ 3\overline{)15}\end{array}$
7.	$\begin{array}{r}3\\ 3\overline{)9}\end{array}$	$\begin{array}{r}0\\ 2\overline{)0}\end{array}$	$\begin{array}{r}4\\ 3\overline{)12}\end{array}$	$\begin{array}{r}8\\ 3\overline{)24}\end{array}$	$\begin{array}{r}7\\ 2\overline{)14}\end{array}$
8.	$\begin{array}{r}3\\ 2\overline{)6}\end{array}$	$\begin{array}{r}1\\ 3\overline{)3}\end{array}$	$\begin{array}{r}7\\ 3\overline{)21}\end{array}$	$\begin{array}{r}5\\ 2\overline{)10}\end{array}$	$\begin{array}{r}9\\ 2\overline{)18}\end{array}$

Pupils who have mastered facts may omit this work (let them make up and illustrate problems for arithmetic corner). Use this page with pupils who had difficulty with page 273. Urge them to respond quickly.

Reinforce relationship between multiplication and division.

How Multiplication Can Help You

▶ If you want to find the answer to a division fact like $3\overline{)12}$, you ask this question: "How many 3's make 12?" To answer this question you have to know that $4 \times 3 = 12$. This multiplication fact tells you that four 3's make 12, so the answer to $3\overline{)12}$ is 4. If you did not know some of the division facts on page 274, first review the multiplication facts. Then try the division facts again.

Tell what numbers should be put in the spaces:

1. You know that $9 \times 3 = 27$, so $3\overline{)27}$ is $\overset{9}{\ldots}$.
2. You know that $\overset{8}{\ldots} \times 2 = 16$, so $2\overline{)16}$ is $\overset{8}{\ldots}$.
3. You know that $\overset{6}{\ldots} \times 2 = 12$, so $2\overline{)12}$ is $\overset{6}{\ldots}$.
4. You know that $\overset{5}{\ldots} \times 3 = 15$, so $3\overline{)15}$ is $\overset{5}{\ldots}$.
5. You know that $\overset{8}{\ldots} \times 3 = 24$, so $3\overline{)24}$ is $\overset{8}{\ldots}$.
6. You know that $\overset{6}{\ldots} \times 3 = 18$, so $3\overline{)18}$ is $\overset{6}{\ldots}$.
7. You know that $\overset{7}{\ldots} \times 2 = 14$, so $2\overline{)14}$ is $\overset{7}{\ldots}$.
8. You know that $\overset{9}{\ldots} \times 2 = 18$, so $2\overline{)18}$ is $\overset{9}{\ldots}$.
9. You know that $\overset{7}{\ldots} \times 3 = 21$, so $3\overline{)21}$ is $\overset{7}{\ldots}$.
10. You know that $\overset{5}{\ldots} \times 2 = 10$, so $2\overline{)10}$ is $\overset{5}{\ldots}$.
11. You know that $\overset{4}{\ldots} \times 3 = 12$, so $3\overline{)12}$ is $\overset{4}{\ldots}$.
12. You know that $\overset{9}{\ldots} \times 2 = 18$, so $2 \times \overset{9}{\ldots} = 18$.
13. You know that $\overset{8}{\ldots} \times 3 = 24$, so $3 \times \overset{8}{\ldots} = 24$.
14. You know that $\overset{5}{\ldots} \times 3 = 15$, so $3 \times \overset{5}{\ldots} = 15$.
15. You know that $\overset{8}{\ldots} \times 2 = 16$, so $2 \times \overset{8}{\ldots} = 16$.
16. You know that $\overset{9}{\ldots} \times 3 = 27$, so $3 \times \overset{9}{\ldots} = 27$.

Urge pupils to respond quickly. Have pupils use related facts in original problems involving multiplication and division.

Test vocabulary words and basic understandings.

Do You Know the Right Word?

Tell the right word that goes in each space. On your paper try to write the word:

1. There are 36 inches in 1 ... yard.
2. 16 ÷ 2 = 8 is called a ... division fact.
3. Rolls, cookies, and eggs are sold by the ... dozen.
4. The month that has less than 30 days is ... February.
5. Thanksgiving Day comes in the month of ... November.
6. Thanksgiving Day always comes on ... Thursday.
7. To share things equally means to ... divide equally.
8. The 12 o'clock that comes between morning and afternoon is called ... noon.
9. The name of the day that always comes on December 25 is ... Christmas.
10. A ... quart of milk makes more glasses of milk than a ... pint of milk. Use **pint** in one space and **quart** in the other space.
11. The sign ÷ means ... divide; the sign + means ... add.
12. You ... divide to find how many 3's there are in 15.
13. The measure I would use to tell the length of a pencil is the ... inch. The measure I would use to tell the length of cloth for a dress is the ... yard. The measure I would use to tell the length of a room is the ... foot.
14. To find how many inches there are in 4 feet, you must ... multiply 12 by 4.
15. To find how many feet there are in 2 yards, you must ... multiply 3 by 2.

Insist that pupils write their answers only on paper. Further review may be needed for some pupils.

Pounds and Ounces

1. Bill is buying a half **pound** of candy. The girl is weighing it for him. A half pound equals 8 **ounces.** You write one half pound like this: $\frac{1}{2}$ pound.

Emphasize.

16 ounces = 1 pound
8 ounces = $\frac{1}{2}$ pound

2. You can buy many things by the pound. Name as many things as you can that are bought by the pound.

3. Things that are small and light are weighed by the ounce. A letter that carries a 4-cent stamp weighs 1 ounce or less. A small candy bar weighs about 2 ounces. Can you name anything else that is weighed by the ounce?

4. Ann weighs 53 pounds now. Last spring she weighed 49 pounds. How many more pounds does Ann weigh now than she did last spring? 4

5. How many ounces are there in 3 pounds? 48

Display, discuss, and list some articles bought by pound. See if some pupils know ounce values of pound and $\frac{1}{2}$ pound. Then proceed with ex. 1–5. Let superior pupils compute weights of others in ounces.

See Guide for correlation of examples with aims.

Chapter Review

Tell what numbers should be put in the spaces:

1. $\overset{8}{\ldots} \times 3 = 24$, so there are $\overset{8}{\ldots}$ 3's in 24.

2. $\overset{7}{\ldots} \times 2 = 14$, so there are $\overset{7}{\ldots}$ 2's in 14.

3. $\overset{6}{\ldots} \times 3 = 18$, so there are $\overset{6}{\ldots}$ 3's in 18.

4. $\overset{9}{\ldots} \times 3 = 27$, so there are $\overset{9}{\ldots}$ 3's in 27.

5. $\frac{1}{2}$ pound = $\overset{8}{\ldots}$ ounces $\qquad$ $\frac{1}{3}$ yard = $\overset{12}{\ldots}$ inches

6. $\frac{1}{2}$ hour = $\overset{30}{\ldots}$ minutes $\qquad$ $\frac{1}{2}$ foot = $\overset{6}{\ldots}$ inches

7. To find $\frac{1}{2}$ of a number, I divide the number by $\overset{2}{\ldots}$

8. To find $\frac{1}{3}$ of a number, I divide the number by $\overset{3}{\ldots}$

Find the answers: Have pupils use $\overline{)\quad}$ sign.

9. $\frac{1}{2}$ of 62 31 $\qquad$ $\frac{1}{3}$ of 129 43 $\qquad$ $\frac{1}{2}$ of 186 96 $\qquad$ $\frac{1}{2}$ of 802 401

10. $\frac{1}{3}$ of 93 31 $\qquad$ $\frac{1}{3}$ of 216 72 $\qquad$ $\frac{1}{2}$ of 104 52 $\qquad$ $\frac{1}{3}$ of 183 61

11. $\frac{1}{3}$ of 36 12 $\qquad$ $\frac{1}{2}$ of 148 74 $\qquad$ $\frac{1}{3}$ of 639 213 $\qquad$ $\frac{1}{2}$ of 120 60

12. $\frac{1}{2}$ of 84 42 $\qquad$ $\frac{1}{3}$ of 150 50 $\qquad$ $\frac{1}{2}$ of 166 83 $\qquad$ $\frac{1}{3}$ of 246 82

Divide. Check your work by multiplying:

13. $\begin{array}{r}10\\2\overline{)20}\end{array}$ $\quad$ $\begin{array}{r}120\\3\overline{)360}\end{array}$ $\quad$ $\begin{array}{r}92\\2\overline{)184}\end{array}$ $\quad$ $\begin{array}{r}320\\3\overline{)960}\end{array}$ $\quad$ $\begin{array}{r}232\\3\overline{)696}\end{array}$ $\quad$ $\begin{array}{r}220\\2\overline{)440}\end{array}$

14. $\begin{array}{r}22\\2\overline{)44}\end{array}$ $\quad$ $\begin{array}{r}122\\3\overline{)366}\end{array}$ $\quad$ $\begin{array}{r}210\\2\overline{)420}\end{array}$ $\quad$ $\begin{array}{r}104\\2\overline{)208}\end{array}$ $\quad$ $\begin{array}{r}82\\3\overline{)246}\end{array}$ $\quad$ $\begin{array}{r}63\\3\overline{)189}\end{array}$

15. $\begin{array}{r}10\\3\overline{)30}\end{array}$ $\quad$ $\begin{array}{r}114\\2\overline{)228}\end{array}$ $\quad$ $\begin{array}{r}110\\3\overline{)330}\end{array}$ $\quad$ $\begin{array}{r}73\\3\overline{)219}\end{array}$ $\quad$ $\begin{array}{r}71\\2\overline{)142}\end{array}$ $\quad$ $\begin{array}{r}310\\3\overline{)930}\end{array}$

16. $\begin{array}{r}41\\2\overline{)82}\end{array}$ $\quad$ $\begin{array}{r}103\\3\overline{)309}\end{array}$ $\quad$ $\begin{array}{r}332\\2\overline{)664}\end{array}$ $\quad$ $\begin{array}{r}211\\3\overline{)633}\end{array}$ $\quad$ $\begin{array}{r}342\\2\overline{)684}\end{array}$ $\quad$ $\begin{array}{r}90\\3\overline{)270}\end{array}$

17. $\begin{array}{r}32\\3\overline{)96}\end{array}$ $\quad$ $\begin{array}{r}80\\2\overline{)160}\end{array}$ $\quad$ $\begin{array}{r}50\\2\overline{)100}\end{array}$ $\quad$ $\begin{array}{r}312\\3\overline{)936}\end{array}$ $\quad$ $\begin{array}{r}230\\3\overline{)690}\end{array}$ $\quad$ $\begin{array}{r}93\\3\overline{)279}\end{array}$

Observe pupils as they work and note errors or hesitancy on progress cards. Determine if difficulties are caused by lack of understanding or basic facts. Reteach accordingly.

Try to get every problem right. Count 10 for each problem you get right.

1. Mother gave Ann 60¢ to buy 3-cent stamps. How many stamps should Ann get? 20

2. Bob earned \$8.65 selling papers, \$4.50 cutting grass, and \$3.75 helping Mr. Green. How much did Bob earn all together? \$16.90

3. Betty wants a bicycle that costs \$42. She has \$34 now. How much more money does she need to save? \$8

4. Dick wants to go to summer camp. It costs \$18 a week to go there. How much money does Dick need for 3 weeks at camp? \$54

5. Jim started for school at 8:25 A.M. He got to school at 8:40 A.M. How many minutes did it take Jim to get to school? 15

6. Peggy bought 9 valentines to send to her friends. She paid 3¢ for each one. How much did the 9 valentines cost? 27¢

7. Jack bought a sweater that cost \$4.69. How much change did he get from \$5.00? \$.31

8. Aunt Mary saved 660 pretty buttons. She gave Ann $\frac{1}{3}$ of them. How many buttons did Ann get? 220

9. Three boys shared the cost of a boat. They paid \$120 for it. How much did each boy have to pay? \$40

10. Last year a bus ticket to White River cost \$6.38. This year the same kind of ticket costs \$7.05. How much more does the ticket cost this year than last? \$.67

Pupils who seem to have difficulty should be urged to "talk out" problems. Have them explain how they know what process to use. Give them further individual help if needed.

Present diagnostic test of division skills.

How Much Have You Learned?

If you miss more than one example in a row, turn to the Practice Page for that row and do the examples on that page.

Give the answers:

						Practice Pages
1.	$\overset{4}{2\overline{)8}}$	$\overset{7}{2\overline{)14}}$	$\overset{2}{2\overline{)4}}$	$\overset{8}{2\overline{)16}}$	$\overset{6}{2\overline{)12}}$	245
2.	$\overset{2}{3\overline{)6}}$	$\overset{8}{3\overline{)24}}$	$\overset{3}{3\overline{)9}}$	$\overset{9}{3\overline{)27}}$	$\overset{4}{3\overline{)12}}$	255
3.	$\overset{0}{3\overline{)0}}$	$\overset{0}{2\overline{)0}}$	$\overset{0}{8\overline{)0}}$	$\overset{0}{5\overline{)0}}$	$\overset{0}{9\overline{)0}}$	271

Divide these numbers and check:

4.	$\overset{43}{2\overline{)86}}$	$\overset{112}{2\overline{)224}}$	$\overset{342}{2\overline{)684}}$	$\overset{413}{2\overline{)826}}$	259
5.	$\overset{21}{3\overline{)63}}$	$\overset{231}{3\overline{)693}}$	$\overset{112}{3\overline{)336}}$	$\overset{321}{3\overline{)963}}$	259
6.	$\overset{74}{2\overline{)148}}$	$\overset{61}{2\overline{)122}}$	$\overset{93}{2\overline{)186}}$	$\overset{52}{2\overline{)104}}$	265
7.	$\overset{52}{3\overline{)156}}$	$\overset{73}{3\overline{)219}}$	$\overset{91}{3\overline{)273}}$	$\overset{82}{3\overline{)246}}$	265
8.	$\overset{20}{2\overline{)40}}$	$\overset{110}{2\overline{)220}}$	$\overset{302}{2\overline{)604}}$	$\overset{70}{2\overline{)140}}$	272
9.	$\overset{30}{3\overline{)90}}$	$\overset{130}{3\overline{)390}}$	$\overset{60}{3\overline{)180}}$	$\overset{300}{3\overline{)900}}$	272

Find the answers:

10.	$\frac{1}{2}$ of 18 9	$\frac{1}{2}$ of 6 3	$\frac{1}{3}$ of 21 7	257
11.	$\frac{1}{2}$ of 242 121	$\frac{1}{2}$ of 182 91	$\frac{1}{2}$ of 464 232	265
12.	$\frac{1}{3}$ of 636 212	$\frac{1}{3}$ of 213 71	$\frac{1}{3}$ of 249 83	265

To the Teacher. Chapter 8 teaches the multiplication and division facts for the 4's and 5's and reviews the year's work. Schools not wishing to teach these facts can use the review on pages 300–310, since the 4's and 5's are omitted on those pages.

Compare results of test with previous one (page 278) as noted on progress cards. Have pupils use practice pages for self assignments. Reteach or drill as needed.

Consult the Teacher's Guide for a discussion of the specific aims of Chapter 8.

Chapter 8*

A Children's Party

Teach multiplication facts of the 4's.

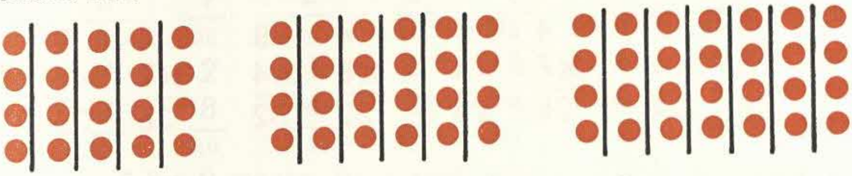
1. You see 4 children at each table. How many children are there at 3 tables?12 How many are three 4's?12 What is 3 × 4?12

$$\begin{array}{r} 4 \\ 4 \\ \underline{4} \end{array}$$

2. How many children are there at 4 tables?16 To find out, write four 4's and add them. How many are four 4's?16 What is 4 × 4?16

$$\begin{array}{r} 4 \\ 4 \\ 4 \\ \underline{4} \end{array}$$

3. Look at the groups of dots below. There are 4 dots in each column. How many dots are there in 5 columns?20 in 6 columns?24 in 7 columns?28



4. How much is 5 × 4?20 6 × 4?24 7 × 4? 28

5. Draw dots to help you find the answer to 8 × 4. How much is 8 × 4?32 Draw more dots to help you find the answer to 9 × 4. 9 × 4 = .36.

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*To the Teacher. See page 327 for suggestions on Chapter 8.

Continue to relate multiplication to addition. In ex. 3 stress the relationships among the facts in this manner, "Since five 4's are 20, then six 4's will be 4 more than 20 or 24, and seven 4's will be 4 more than 24 or 28."

Teach reverses of multiplication facts of the 4's.

More about the 4's

1. At the left you see stars in rows. Joe says there are 5 rows with 4 stars in each row. How much is 5 × 4? 20

2. Sally says there are 4 rows with 5 stars in each row. How many are four 5's? 20 What is 4 × 5? 20

3. You see that 5 × 4 and 4 × 5 are a pair of multiplication facts. Both facts have 20 for the product.

4. On page 281 you learned that $6 \times 4 = 24$. What other fact goes with $6 \times 4 = 24$? 4x6=24

5. $7 \times 4 = \overset{28}{\ldots}$, so $4 \times 7 = \overset{28}{\ldots}$ Four 7's are $\overset{28}{\ldots}$

6. $8 \times 4 = \overset{32}{\ldots}$, so $4 \times 8 = \overset{32}{\ldots}$ Four 8's are $\overset{32}{\ldots}$

7. $9 \times 4 = \overset{36}{\ldots}$, so $4 \times 9 = \overset{36}{\ldots}$ Four 9's are $\overset{36}{\ldots}$

8. Here are the multiplication facts for the 4's. You know the first 6 facts. Learn the other facts:

$$\begin{array}{r}4\\ \times 1\\ \hline 4\end{array}\quad\begin{array}{r}1\\ \times 4\\ \hline 4\end{array}\qquad\begin{array}{r}4\\ \times 2\\ \hline 8\end{array}\quad\begin{array}{r}2\\ \times 4\\ \hline 8\end{array}\qquad\begin{array}{r}4\\ \times 3\\ \hline 12\end{array}\quad\begin{array}{r}3\\ \times 4\\ \hline 12\end{array}\qquad\begin{array}{r}4\\ \times 5\\ \hline 20\end{array}\quad\begin{array}{r}5\\ \times 4\\ \hline 20\end{array}\qquad\begin{array}{r}4\\ \times 4\\ \hline 16\end{array}$$

$$\begin{array}{r}4\\ \times 6\\ \hline 24\end{array}\quad\begin{array}{r}6\\ \times 4\\ \hline 24\end{array}\qquad\begin{array}{r}4\\ \times 7\\ \hline 28\end{array}\quad\begin{array}{r}7\\ \times 4\\ \hline 28\end{array}\qquad\begin{array}{r}4\\ \times 8\\ \hline 32\end{array}\quad\begin{array}{r}8\\ \times 4\\ \hline 32\end{array}\qquad\begin{array}{r}4\\ \times 9\\ \hline 36\end{array}\quad\begin{array}{r}9\\ \times 4\\ \hline 36\end{array}$$

Multiply these numbers:

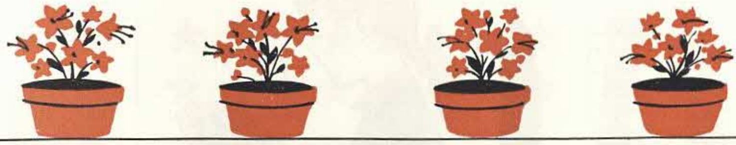
9. $$\begin{array}{r}4\\ 5\\ \hline 20\end{array}\quad\begin{array}{r}7\\ 4\\ \hline 28\end{array}\quad\begin{array}{r}4\\ 0\\ \hline 0\end{array}\quad\begin{array}{r}4\\ 4\\ \hline 16\end{array}\quad\begin{array}{r}4\\ 2\\ \hline 8\end{array}\quad\begin{array}{r}8\\ 4\\ \hline 32\end{array}\quad\begin{array}{r}4\\ 3\\ \hline 12\end{array}\quad\begin{array}{r}4\\ 9\\ \hline 36\end{array}\quad\begin{array}{r}6\\ 4\\ \hline 24\end{array}$$

10. $$\begin{array}{r}4\\ 8\\ \hline 32\end{array}\quad\begin{array}{r}1\\ 4\\ \hline 4\end{array}\quad\begin{array}{r}9\\ 4\\ \hline 36\end{array}\quad\begin{array}{r}0\\ 4\\ \hline 0\end{array}\quad\begin{array}{r}4\\ 6\\ \hline 24\end{array}\quad\begin{array}{r}3\\ 4\\ \hline 12\end{array}\quad\begin{array}{r}5\\ 4\\ \hline 20\end{array}\quad\begin{array}{r}2\\ 4\\ \hline 8\end{array}\quad\begin{array}{r}4\\ 7\\ \hline 28\end{array}$$

Stress fact that pupils can discover new facts from known ones. Let pupils verify them by addition. Make flash cards for new facts and enter reverses on multiplication tables.

Present oral review of all multiplication facts.

Using Multiplication Facts



PLANTS
$3
EACH

1. At $3 each, find the cost of 4 plants. $12
2. Find the cost of 4 pencils at 4¢ each. 16¢
3. Find the cost of 4 apples at 7¢ each. 28¢
4. There are 4 glasses of milk in 1 quart. How many glasses can you get from 6 quarts of milk? 24

Multiply these numbers:

5.	7	1	3	4	9	3	4	9	4
	4	7	4	6	2	5	2	4	3
	28	7	12	24	18	15	8	36	12
6.	5	0	8	0	4	6	8	2	4
	4	4	3	3	8	2	2	3	4
	20	0	24	0	32	12	16	6	16
7.	3	6	2	2	1	5	2	3	4
	3	4	6	4	9	3	7	9	1
	9	24	12	8	9	15	14	27	4
8.	3	2	4	2	7	3	4	2	4
	8	5	9	2	2	6	0	9	7
	24	10	36	4	14	18	0	18	28
9.	4	7	2	1	6	8	1	9	3
	5	3	8	4	3	4	6	3	7
	20	21	16	4	18	32	6	27	21

10. Do ex. 5 to 9 again in a new way. Each time after you multiply, add 2 to the answer. For example, in ex. 5, think, "4 × 7 = 28. 28 + 2 = 30." Give only the answer, 30. Do each exercise this way. See Guide.

11. Multiply each of these numbers by 4; (1) by 3: (2)

(1)	24	8	32	20	4	36	12	28	16
	6	2	8	5	1	9	3	7	4
(2)	18	6	24	15	3	27	9	21	12

Encourage pupils to respond quickly. Let pupils who need further review work with partners, using fact cards. Excercises like ex. 10 are good for short daily reviews.

Extend multiplication of 1-figure and 2-figure numbers, using the 4's.

Using 4's in Multiplication

1. Jane bought 4 dozen paper hats for her party. How many paper hats did Jane buy all together? 48

2. The paper hats cost \$.70 a dozen. How much did 4 dozen cost? \$2.80

3. Jane also bought 4 prizes to give at her party. Each prize cost \$.75. How much did 4 prizes cost? \$3.00

Multiply. Check your work by going over it:

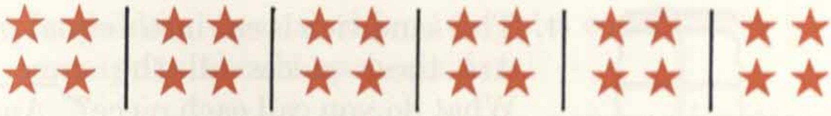
4.	53 4 212	19 4 76	72 4 288	205 4 820	\$.68 4 \$2.72	\$1.24 4 \$4.96
5.	26 4 104	38 4 152	47 4 188	121 4 484	\$.89 4 \$3.56	\$2.17 4 \$8.68
6.	64 4 256	91 4 364	85 4 340	224 4 896	\$.37 4 \$1.48	\$2.21 4 \$8.84
7.	44 3 132	14 5 70	43 7 301	547 2 1094	\$.93 4 \$3.72	\$1.14 6 \$6.84
8.	24 9 216	90 4 360	34 8 272	419 4 1676	\$.49 3 \$1.47	\$8.35 2 \$16.70

More Practice. See ㊳ on page 326.

Do some problems orally to check on understanding of process and mastery of facts. Be sure pupils add carried number after multiplication of tens. Review meaning of decimal point.

Teach division facts of the 4's.

How Many Equal Groups?



1. Here are 24 stars. The stars are divided into groups with 4 stars in each group. How many groups are there? 6 How many 4's are there in 24? 6

2. Bill said he knew there were 6 groups of 4 stars in 24 stars because six 4's make 24. Is Bill right? Yes

Tell what numbers go in the spaces:

3. $\overset{5}{\ldots}$ 4's make 20, so $4\overline{)20}$ equals $\overset{5}{\ldots}$

4. $\overset{8}{\ldots}$ 4's make 32, so $4\overline{)32}$ equals $\overset{8}{\ldots}$

5. $\overset{4}{\ldots}$ 4's make 16, so $4\overline{)16}$ equals $\overset{4}{\ldots}$

6. $\overset{9}{\ldots}$ 4's make 36, so $4\overline{)36}$ equals $\overset{9}{\ldots}$

7. $\overset{7}{\ldots}$ 4's make 28, so $4\overline{)28}$ equals $\overset{7}{\ldots}$

8. Learn these division facts: Make flash cards.

$$\begin{array}{r}1\\4\overline{)4}\end{array}\qquad\begin{array}{r}2\\4\overline{)8}\end{array}\qquad\begin{array}{r}3\\4\overline{)12}\end{array}\qquad\begin{array}{r}4\\4\overline{)16}\end{array}\qquad\begin{array}{r}5\\4\overline{)20}\end{array}$$

$$\begin{array}{r}6\\4\overline{)24}\end{array}\qquad\begin{array}{r}7\\4\overline{)28}\end{array}\qquad\begin{array}{r}8\\4\overline{)32}\end{array}\qquad\begin{array}{r}9\\4\overline{)36}\end{array}$$

9. Write the nine division facts in ex. 8 in another way, like this: $4 \div 4 = 1$, $8 \div 4 = 2$, and so on.

10. Read these and give the answers:

$$\begin{array}{r}5\\4\overline{)20}\end{array}\qquad\begin{array}{r}2\\4\overline{)8}\end{array}\qquad\begin{array}{r}8\\4\overline{)32}\end{array}\qquad\begin{array}{r}4\\4\overline{)16}\end{array}\qquad\begin{array}{r}7\\4\overline{)28}\end{array}\qquad\begin{array}{r}9\\4\overline{)36}\end{array}\qquad\begin{array}{r}6\\4\overline{)24}\end{array}$$

If you forget the answer to a fact like $20 \div 4$, think, "How many 4's make 20?" What does $4\overline{)20}$ equal? 5

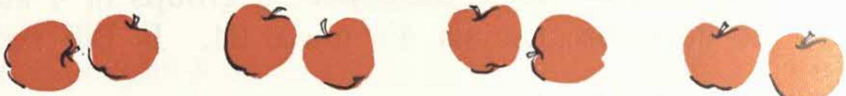
Have pupils discover facts through known related multiplication facts. If needed, let them use dot drawings to represent facts. Have pupils verify facts by subtraction.

Teach how to find one fourth of a number.

One Fourth

1. This sandwich is cut into 4 equal pieces. Are these pieces all the same size? Yes What do you call each piece? One fourth Another name for **one fourth** is **one quarter.** Which is larger, $\frac{1}{4}$ of a sandwich or $\frac{1}{2}$ of a sandwich? $\frac{1}{2}$

2. These 8 apples have been put into 4 equal groups.



What do you call each group? One fourth, or one quarter How much is $\frac{1}{4}$ of 8? 2 How much is $8 \div 4$? 2 Does $8 \div 4$ have the same answer as $\frac{1}{4}$ of 8? Yes

Emphasize.

To find $\frac{1}{4}$ of a number, divide it by 4.

3. Use 12 play pennies. Put them one at a time into 4 equal groups. How many pennies are there in each group? 3 How much is $\frac{1}{4}$ of 12? 3 How much is $12 \div 4$? 3

4. Jack bought 24 marbles. He gave $\frac{1}{4}$ of them to Tom. How many marbles did Jack give Tom? 6

5. Ann earned \$16. She put $\frac{1}{4}$ of this money in her bank. How many dollars did Ann put in her bank? \$4

Find the answers: Use drawings if needed.

6. $\frac{1}{4}$ of 4 1 $\frac{1}{4}$ of 20 5 $\frac{1}{4}$ of 12 3 $\frac{1}{4}$ of 28 7

7. $\frac{1}{4}$ of 8 2 $\frac{1}{4}$ of 32 8 $\frac{1}{4}$ of 24 6 $\frac{1}{4}$ of 36 9

Review and demonstrate one fourth of single object. Then use materials (discs, buttons) to show one fourth of group of objects, stressing that $\frac{1}{4}$ means to divide by 4.

Provide problems involving division facts of the 4's.

Using the 4's

1. Four children want to share 16 apples equally. How many apples should each child get? 4

2. How many crayons, at 4¢ each, can you buy for 20¢? 5 for 8¢? 2 for 36¢? 9 for 24¢? 6

3. Mother baked cookies in a large pan. She put 4 cookies in a row and there were 6 rows. How many cookies were there in that pan? 24

4. In a parade the 32 children in Ann's room marched by 4's. How many rows did they make? 8

5. Father rides on the bus 4 times each day. He pays 9¢ each time he rides. How much does Father pay to ride on the bus each day? 36¢

6. How many inches are there in 1 yard? 36 How many inches are there in $\frac{1}{4}$ yard? 9

7. How many ounces are there in 1 pound? 16 How many ounces are there in $\frac{1}{4}$ pound? 4

8. How many quarts are there in 1 gallon? 4 How many quarts are there in 5 gallons? 20 in 8 gallons? 32

9. There are 480 tickets for the school circus. The children in Peggy's room will try to sell $\frac{1}{4}$ of them. How many tickets will they try to sell? 120

Divide. Check your work by multiplying:

10. $\begin{array}{r}12\\4\overline{)48}\end{array}$ $\begin{array}{r}71\\4\overline{)284}\end{array}$ $\begin{array}{r}32\\4\overline{)128}\end{array}$ $\begin{array}{r}80\\4\overline{)320}\end{array}$ $\begin{array}{r}92\\4\overline{)368}\end{array}$ $\begin{array}{r}42\\4\overline{)168}\end{array}$

11. $\begin{array}{r}20\\4\overline{)80}\end{array}$ $\begin{array}{r}102\\4\overline{)408}\end{array}$ $\begin{array}{r}51\\4\overline{)204}\end{array}$ $\begin{array}{r}41\\4\overline{)164}\end{array}$ $\begin{array}{r}62\\4\overline{)248}\end{array}$ $\begin{array}{r}110\\4\overline{)440}\end{array}$

More Practice. See ㊴ on page 326.

Pupils who hesitate on problems should discuss solutions, giving reasons for process use. In ex. 10-11, remind pupils of left-to-right direction and proper placement of quotient.

Teach multiplication facts of the 5's.

The 5's in Multiplication

1. Dick is counting the pennies in his bank. He has put them in 6 piles of 5 pennies each. Count the pennies by 5's to tell how many there are in all. 30 How many are six 5's? 30 What is 6 × 5? 30

2. Ann knows another way to find how many six 5's are. She says, "I know that five 5's are 25 because 5 nickels make 25¢. So six 5's are 5 more than 25, or 30." What is 6 × 5? 30

3. How many are seven 5's? Think, "Six 5's are 30, so seven 5's are $\overset{5}{\dots}$ more than 30, or $\overset{35}{\dots}$." What is 7 × 5? 35

4. How much is 8 × 5? 40 How much is 9 × 5? 45 Use Ann's way to find the answers. Seven 5's are 35, so eight 5's are 5 more than 35, or 40; eight 5's are 40, so nine 5's are 5 more than 40, or 45.

What numbers should be put in the spaces?

5. $9 \times 5 = \overset{45}{\dots}$ $1 \times 5 = \overset{5}{\dots}$ $4 \times 5 = \overset{20}{\dots}$

6. $2 \times 5 = \overset{10}{\dots}$ $6 \times 5 = \overset{30}{\dots}$ $0 \times 5 = \overset{0}{\dots}$

7. $5 \times 5 = \overset{25}{\dots}$ $3 \times 5 = \overset{15}{\dots}$ $7 \times 5 = \overset{35}{\dots}$

8. At 5¢ each, how much will 7 pencils cost? 35¢

9. At 5¢ each, find the cost of 8 crayons. 40¢

10. At 5¢ each, how much will 3 oranges cost? 15¢

11. At 5¢ each, find the cost of 6 post cards. 30¢

12. At 5¢ each, find the cost of 9 buttons. 45¢

13. At 5¢ each, find the cost of 4 candles. 20¢

Review counting by 5's first, using number chart (page 30). Stress, while counting, that one 5 is 5, two 5's are 10, and so on. Have pupils post facts on own tables. Some pupils may need objects to discover facts.

Teach reverses of multiplication facts of the 5's.

The 5's Multiplication Facts

1. How much is 5 × 4? 20 How much is 4 × 5? 20 You see that 5 × 4 and 4 × 5 each have the same product, which is 20. The numbers in 5 × 4 are the same as those in 4 × 5 but they are reversed.

$$\begin{array}{r} 4 \\ \times 5 \\ \hline 20 \end{array} \qquad \begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$$

2. How much is 6 × 5? 30 If you reverse the numbers, you get 5 × 6. How much is 5 × 6? 30

3. How much is 7 × 5? 35 5 × 7? 35 How much is 8 × 5? 40 5 × 8? 40 How much is 9 × 5? 45 5 × 9? 45

4. Here are the multiplication facts for the 5's. You know the first 8 facts. Learn the other facts:

Stress relationships among the number facts.

$$\begin{array}{r} 5 \\ \times 1 \\ \hline 5 \end{array} \quad \begin{array}{r} 1 \\ \times 5 \\ \hline 5 \end{array} \qquad \begin{array}{r} 5 \\ \times 2 \\ \hline 10 \end{array} \quad \begin{array}{r} 2 \\ \times 5 \\ \hline 10 \end{array} \qquad \begin{array}{r} 5 \\ \times 3 \\ \hline 15 \end{array} \quad \begin{array}{r} 3 \\ \times 5 \\ \hline 15 \end{array} \qquad \begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array} \quad \begin{array}{r} 4 \\ \times 5 \\ \hline 20 \end{array} \qquad \begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$$

$$\begin{array}{r} 5 \\ \times 6 \\ \hline 30 \end{array} \quad \begin{array}{r} 6 \\ \times 5 \\ \hline 30 \end{array} \qquad \begin{array}{r} 5 \\ \times 7 \\ \hline 35 \end{array} \quad \begin{array}{r} 7 \\ \times 5 \\ \hline 35 \end{array} \qquad \begin{array}{r} 5 \\ \times 8 \\ \hline 40 \end{array} \quad \begin{array}{r} 8 \\ \times 5 \\ \hline 40 \end{array} \qquad \begin{array}{r} 5 \\ \times 9 \\ \hline 45 \end{array} \quad \begin{array}{r} 9 \\ \times 5 \\ \hline 45 \end{array}$$

Multiply these numbers:

5. $\begin{array}{r} 7 \\ 5 \\ \hline 35 \end{array} \quad \begin{array}{r} 1 \\ 5 \\ \hline 5 \end{array} \quad \begin{array}{r} 3 \\ 5 \\ \hline 15 \end{array} \quad \begin{array}{r} 5 \\ 6 \\ \hline 30 \end{array} \quad \begin{array}{r} 5 \\ 9 \\ \hline 45 \end{array} \quad \begin{array}{r} 0 \\ 5 \\ \hline 0 \end{array} \quad \begin{array}{r} 4 \\ 5 \\ \hline 20 \end{array} \quad \begin{array}{r} 8 \\ 5 \\ \hline 40 \end{array} \quad \begin{array}{r} 5 \\ 2 \\ \hline 10 \end{array}$

6. $\begin{array}{r} 6 \\ 5 \\ \hline 30 \end{array} \quad \begin{array}{r} 2 \\ 5 \\ \hline 10 \end{array} \quad \begin{array}{r} 5 \\ 8 \\ \hline 40 \end{array} \quad \begin{array}{r} 5 \\ 0 \\ \hline 0 \end{array} \quad \begin{array}{r} 5 \\ 5 \\ \hline 25 \end{array} \quad \begin{array}{r} 5 \\ 3 \\ \hline 15 \end{array} \quad \begin{array}{r} 9 \\ 5 \\ \hline 45 \end{array} \quad \begin{array}{r} 5 \\ 4 \\ \hline 20 \end{array} \quad \begin{array}{r} 5 \\ 7 \\ \hline 35 \end{array}$

7. Find the cost of 5 books at \$3 each. \$15

8. Find the cost of 5 bus tickets at 7¢ each. 35¢

9. Find the cost of 6 sweaters at \$5 each. \$30

10. Find the cost of 5 presents at \$2 each. \$10

Teach new facts through commutative principle. Have pupils prove facts by addition. Let pupils make dot drawings to show new facts. Make flash cards for further study and drill.

Using the 5's in Multiplication

1. Father took 5 children to the airfield. He paid $.15 to let each child go through the gate. How much did he pay for the 5 children? $.75

2. Father bought 5 bags of peanuts for the children. Each bag cost $.10. How much did the peanuts cost? $.50

Multiply. Check your work by going over it:

3.	43 5 215	20 5 100	56 5 280	118 5 590	$.67 5 $3.35	$4.19 5 $20.95
4.	38 5 190	52 7 364	64 5 320	715 4 2860	$.32 5 $1.60	$1.05 6 $6.30
5.	75 5 375	98 5 490	35 9 315	628 3 1884	$.90 5 $4.50	$2.05 8 $16.40

More Practice. See ㊵ on page 326.

Have pupils explain work orally to check carrying process. Ask them why number carried is added to tens after multiplication. Assign "More Practice" to those who hesitate.

Teach division facts of the 5's (pages 291-292).

Dividing by 5

1. Susan has 25 pennies. She wants to change the pennies into nickels. She puts the pennies in groups of 5 pennies each, as shown above. How many groups are there? 5 How many nickels will Susan get? 5 How much is 25 ÷ 5? 5

2. Dick says he knows that five 5's make 25, so he knows that 25 ÷ 5 = 5. How much is $5\overline{)25}$? 5

3. How many 5's make 40? How much is $5\overline{)40}$? 8

4. You know that six 5's are 30. What division fact can you get from this? 30 ÷ 5 = 6

Tell what numbers go in the spaces:

5. . .8. 5's make 40, so $5\overline{)40}$ equals . .8.
6. . .4. 5's make 20, so $5\overline{)20}$ equals . .4.
7. . .7. 5's make 35, so $5\overline{)35}$ equals . .7.
8. . .9. 5's make 45, so $5\overline{)45}$ equals . .9.
9. . .3. 5's = 15   5 ÷ 5 = . .1.   20 ÷ 5 = . .4.
10. . .6. 5's = 30   0 ÷ 5 = . .0.   45 ÷ 5 = . .9.
11. . .5. 5's = 25   10 ÷ 5 = . .2.   35 ÷ 5 = . .7.

12. Jane has 30 pennies. She wants to have them changed into nickels. How many nickels will she get? 6

13. Five children shared 40 nuts equally. How many nuts did each child get? 8

Stress subtractive nature of division and relation of facts to multiplication ones. See pages 241-245, 254-255, 285 for suggestions. Let pupils use materials if necessary.

The 5's Facts in Division

1. How many 5's make 15?3 How much is $\overset{3}{5\overline{)15}}$?

2. How many 5's make 35?7 How much is $\overset{7}{5\overline{)35}}$?

3. Learn these new division facts: Make practice cards.

$$\overset{1}{5\overline{)5}} \qquad \overset{2}{5\overline{)10}} \qquad \overset{3}{5\overline{)15}} \qquad \overset{4}{5\overline{)20}} \qquad \overset{5}{5\overline{)25}}$$

$$\overset{6}{5\overline{)30}} \qquad \overset{7}{5\overline{)35}} \qquad \overset{8}{5\overline{)40}} \qquad \overset{9}{5\overline{)45}}$$

Stress relationships among the number facts.

4. Write the nine division facts in ex. 3 in another way, like this: $5 \div 5 = 1$, $10 \div 5 = 2$, and so on. See Guide.

5. Which division fact in ex. 3 comes from $6 \times 5 = 30$? The sixth
Which division fact comes from $9 \times 5 = 45$? The ninth

6. Read these and give the answers:

$$\overset{8}{5\overline{)40}} \qquad \overset{1}{5\overline{)5}} \qquad \overset{7}{5\overline{)35}} \qquad \overset{9}{5\overline{)45}} \qquad \overset{5}{5\overline{)25}} \qquad \overset{3}{5\overline{)15}} \qquad \overset{6}{5\overline{)30}}$$

If you forget the answer to a fact like $40 \div 5$, think, "How many 5's make 40?" What does $5\overline{)40}$ equal? 8

7. Jack spent 30¢ for 5-cent packages of seeds. How many packages did he buy? 6

8. At 5¢ a sheet, how many sheets of colored paper can I buy for 25¢? 5

9. Betty bought 35 plants for her garden. She made 5 rows with the same number of plants in each row. How many plants were there in each row? 7

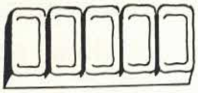
10. At 5¢ each, how many apples can I buy for 40¢? 8

11. Five children can ride in each car. How many cars are needed to take 20 children on a picnic? 4

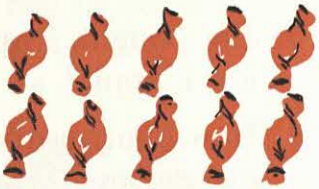
Check understanding of facts by having pupils make up own problems for class to solve. Have pupils use flash cards with partners to speed up response.

Teach how to find one fifth of a number.

One Fifth



1. This candy bar is marked into 5 equal parts. Each part is **one fifth** of the whole bar. You write one fifth like this: $\frac{1}{5}$. Which is larger, $\frac{1}{5}$ of a candy bar or $\frac{1}{2}$ of a candy bar? $\frac{1}{2}$



2. Betty Ann had 10 candies. She shared them equally with 4 other girls. The 10 candies were divided into 5 equal groups. What do you call each group? One fifth What is $\frac{1}{5}$ of 10 candies? 2 How much is 10 ÷ 5? 2 Does 10 ÷ 5 have the same answer as $\frac{1}{5}$ of 10? Yes

Emphasize.

To find $\frac{1}{5}$ of a number, divide it by 5.

3. Draw 5 groups of dots on your paper with 4 dots in each group. How many dots did you draw? 20 How many dots are there in each group? 4 How much is $\frac{1}{5}$ of 20? 4 How much is 20 ÷ 5? 4

4. How much is $\frac{1}{5}$ of 40¢? 8¢ $\frac{1}{5}$ of 30¢? 6¢ $\frac{1}{5}$ of 5¢? 1¢

5. Five boys shared 35 marbles equally. How many marbles did each boy get? 7

Find the answers:

6. $\frac{1}{5}$ of 5 1 $\frac{1}{5}$ of 25 5 $\frac{1}{5}$ of 35 7 $\frac{1}{5}$ of 15 3
7. $\frac{1}{2}$ of 8 4 $\frac{1}{5}$ of 40 8 $\frac{1}{5}$ of 10 2 $\frac{1}{5}$ of 30 6
8. $\frac{1}{4}$ of 4 1 $\frac{1}{5}$ of 20 4 $\frac{1}{5}$ of 45 9 $\frac{1}{4}$ of 28 7

Explain one fifth of single object, using materials, stressing 5 equal parts. Then demonstrate one fifth of group of objects, stressing above boxed statement.

Provide practice in dividing 2-figure and 3-figure numbers by 2, 3, 4, and 5.

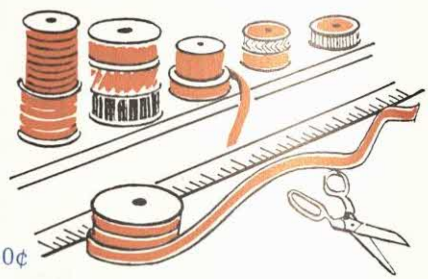
Problems and Practice

1. How many cents are there in one quarter? 25 How many nickels are there in one quarter? 5

2. Jack paid 20¢ for a box of 5 crayons. How much did 1 crayon cost? 4¢

3. Jim bought 5 apples for 30¢. How much did he pay for 1 apple? 6¢

4. How many cents are there in one dollar? 100 How many nickels are there in one dollar? 20



5. A 5-yard roll of ribbon costs 55¢. What is the cost of 1 yard of this ribbon? 11¢

6. Mary paid 50¢ for 5 tickets for the bus. How much did 1 ticket cost? 10¢

7. Ann saves $\frac{1}{5}$ of all the money she earns. How much will she save when she earns 40¢? 8¢ 25¢? 5¢ 50¢? 10¢ $5? $1

8. Father gave Peter 15¢. How many 5-cent post cards can Peter buy for 15¢? 3

9. How many 5-cent candy bars can Peggy buy for 25¢? 5

Divide. Check your work by multiplying:

10.	$\begin{array}{r} 11 \\ 5\overline{)55} \end{array}$	$\begin{array}{r} 40 \\ 5\overline{)200} \end{array}$	$\begin{array}{r} 81 \\ 5\overline{)405} \end{array}$	$\begin{array}{r} 30 \\ 5\overline{)150} \end{array}$	$\begin{array}{r} 60 \\ 5\overline{)300} \end{array}$	$\begin{array}{r} 21 \\ 5\overline{)105} \end{array}$
11.	$\begin{array}{r} 10 \\ 4\overline{)40} \end{array}$	$\begin{array}{r} 61 \\ 5\overline{)305} \end{array}$	$\begin{array}{r} 20 \\ 5\overline{)100} \end{array}$	$\begin{array}{r} 70 \\ 5\overline{)350} \end{array}$	$\begin{array}{r} 91 \\ 5\overline{)455} \end{array}$	$\begin{array}{r} 100 \\ 5\overline{)500} \end{array}$
12.	$\begin{array}{r} 10 \\ 5\overline{)50} \end{array}$	$\begin{array}{r} 31 \\ 5\overline{)155} \end{array}$	$\begin{array}{r} 80 \\ 5\overline{)400} \end{array}$	$\begin{array}{r} 101 \\ 5\overline{)505} \end{array}$	$\begin{array}{r} 50 \\ 5\overline{)250} \end{array}$	$\begin{array}{r} 110 \\ 5\overline{)550} \end{array}$
13.	$\begin{array}{r} 42 \\ 2\overline{)84} \end{array}$	$\begin{array}{r} 111 \\ 5\overline{)555} \end{array}$	$\begin{array}{r} 90 \\ 5\overline{)450} \end{array}$	$\begin{array}{r} 41 \\ 5\overline{)205} \end{array}$	$\begin{array}{r} 201 \\ 4\overline{)804} \end{array}$	$\begin{array}{r} 71 \\ 5\overline{)355} \end{array}$
14.	$\begin{array}{r} 13 \\ 3\overline{)39} \end{array}$	$\begin{array}{r} 51 \\ 5\overline{)255} \end{array}$	$\begin{array}{r} 231 \\ 3\overline{)693} \end{array}$	$\begin{array}{r} 301 \\ 2\overline{)602} \end{array}$	$\begin{array}{r} 102 \\ 3\overline{)306} \end{array}$	$\begin{array}{r} 120 \\ 4\overline{)480} \end{array}$

Observe pupils as they work to see if basic facts or thought patterns are causing difficulty. Group for further review. In ex. 10–14, be sure pupils use left-to-right direction. Have pupils explain placement of quotients.

Provide problem test involving division.

A Test on the 4's and 5's

1. Betty saved 45 pennies. She had them changed into nickels. How many nickels did she get? 9
2. How many 4-cent pencils can Jim buy for 20¢? 5
3. Mother paid 50¢ for a 5-pound bag of sugar. How much did 1 pound of sugar cost? 10¢
4. Jack earned $80 last summer. He put $\frac{1}{4}$ of it in the bank. How much money did Jack put in the bank? $20
5. How many cents are there in one dollar? 100 How many nickels are there in one dollar? 20

How Much Have You Learned?

Present diagnostic test of multiplication and division.

If you miss more than one example in a row, turn to the Practice Page for that row and do the examples on that page.

Multiply and check the work:

						Practice Pages
6.	29 4 116	87 4 348	123 4 492	114 7 798	216 4 864	284
7.	65 5 325	29 5 145	113 5 565	105 8 840	117 5 585	290

Divide these numbers and check:

8.	22 4)88	81 4)324	52 4)208	120 4)480	287
9.	10 5)50	81 5)405	60 5)300	101 5)505	294

Note pupils who hesitate on problems and determine cause of difficulty. Work with them in solving other similar problems. Note pupils' errors in ex. 6–9 and regroup for reteaching.

Present written review of time and money, in problems.

Everyday Problems

1. At 10:20 on Saturday Bill went to play ball. He came home at 12:05. How long was Bill away from home? Look at a clock if you need help. 1 hour 45 minutes

2. Dick played in the park from 2:45 until 4:15. How long did he play in the park? Look at a clock. 1 hour 30 minutes

3. At 3:30 Mary went out to roller skate. Her mother said she could stay out for 45 minutes. At what time should Mary go home? 4:15

4. Peter had a dollar in his pocket. He bought 3 cans of dog food at 17¢ each. Did Peter have any money left? Yes If so, how much? 49¢

5. At a party Jack guessed that Betty weighed 60 pounds. Betty really weighed 56 pounds. How much less did Betty weigh than Jack guessed? 4 pounds

6. School was out on June 22. It started again on September 7. How many weeks are there from June 22 to September 7? 11 Look at a calendar.

7. In ex. 6, how many days are there from June 22 to September 7? 77

8. For lunch at school Bob spent 8¢, 4¢, 10¢, 3¢, and 4¢. He had a one-dollar bill to pay for his lunch. How much change did Bob get? 71¢

9. Father gave the man a 5-dollar bill to pay for a hammer that cost $1.58. Count the change Father got. $1.58, $1.59, $1.60, $1.70, $1.75, $2.00, $3.00, $4.00, $5.00

10. At 2:25 Alice began to practice for 45 minutes. At what time would she stop? Look at a clock. 3:10

Some pupils may need further review of time and money concepts. Let other pupils work at arithmetic corner.

Making Your Own Problems

1. Mary has 50¢ and Bill has 43¢. First make 2 different subtraction problems about their money. Next make 1 addition problem about their money.
2. Bring to school some prices you found in a newspaper. Make an addition problem about some of these prices. Make a subtraction problem about two of them.
3. Make a problem about making change from a half dollar. Make another about change from a dollar.
4. Make problems that use these number words. Make 1 problem for each word or group of words:

sold
earned
bought
2 times as long
4¢ more than
3 times as many
older than
shorter than
shared equally

5. Make an addition problem about picking more roses.
6. Make a subtraction problem about giving away something; about rabbits running away.
7. Make a problem about money you have earned, or saved, or spent.
8. Make a division problem about sharing 246 buttons.
9. Make an addition problem about saving money.
10. Make a multiplication problem about buying or selling boxes of eggs.
11. Make a problem in which you add three 1-place numbers. Make a problem in which you add three 2-place numbers.
12. Make a problem in which you subtract a 2-place number from a 2-place number.

Let pupils work in pairs, exchanging problems with partners. Have different pupils read their problems for class to solve. Spot-check for lack of understandings, as evidenced by their problems.

Review work in counting and measuring.

Can You Do These Things?

1. Write 3 two-place numbers, using only the figures 3, 4, and 5. Use each figure only once in each number. Write 3 three-place numbers in the same way. Here are two examples: 53; 435.

2. Write the names of 2 things you measure by the yard; of 2 things you measure by the quart; of 2 things you measure by the pound.

3. Draw 6 clock faces. On these clocks draw hands to show 3:00; 6:00; 11:00; 7:30; 1:30; 9:30.

4. Make a calendar for your birthday month this year.

5. Draw a picture to show that two 6's are 12.

6. Write 5 subtraction facts that have 5 for the remainder. Write 5 addition facts that have 11 for the sum. Write 4 multiplication facts that have 18 for the product.

7. Count by 10's from 27 to 97;(1) from 33 to 103.(2) (1)27, 37,
47, 57, 67, 77, 87, 97; (2)33, 43, 53, 63, 73, 83, 93, 103

8. Count by 5's from 43 to 98;(1) from 26 to 61.(2) (1)43, 48,
53, 58, 63, 68, 73, 78, 83, 88, 93, 98; (2)26, 31, 36, 41, 46, 51, 56, 61

9. Count by 2's from 31 to 81;(1) from 45 to 95.(2) (1)31, 33, 35,
37, 39, 41, 43, (2)45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85,
87, 89, 91, 93, 95

10. Count by 1's from 20 back to 1.
20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1

11. Count by 5's from 50 back to 5.
50, 45, 40, 35, 30, 25, 20, 15, 10, 5

12. Draw a picture to show 16 marbles divided into two equal groups. Draw another picture to show how 16 marbles can be divided into two groups that are not equal.

13. Add 3 to the answer each time you multiply:

3	2	3	3	2	2	3	3	3
9	7	6	8	5	9	4	7	5
27, 30	14, 17	18, 21	24, 27	10, 13	18, 21	12, 15	21, 24	15, 18

Note areas of class or individual weaknesses and plan for further review.

Determine process to be used in problems without numbers.

Problems without Numbers

Tell whether you add, subtract, multiply, or divide to get each answer:

1. Betty knows the cost of one pencil. She knows how many pencils she wants to buy. How can she find the cost of all of them? Multiply

2. Jim knows the price of a book, a game, and a ball. He wants to buy all three. How can he find the cost of all three things? Add

3. Ann knows the price of a doll she wants. She has some money but not enough to buy it. How can she find how much more money she needs? Subtract

4. Peter and Jim know how many stamps they are to share equally. How can they find each one's share of the stamps? Divide

5. Peggy knows how much money her father gave her to buy three-cent stamps. How can Peggy find the number of stamps she should get? Divide

6. Bob knows how many minutes he practiced after breakfast, how many at noon, and how many after school. How can he find how many minutes he practiced in all? Add

7. Jim knows how many marbles there are in one bag. He also knows how many bags of marbles he bought. How can he find the number of marbles he bought? Multiply

8. Bill and Dick know how many cents each one has. How can they find how much more or less Bill has than Dick? Subtract

Reserve this type of activity for superior pupils. If time permits, let all pupils try this page, but do not attempt to explain the work to entire class.

Provide end-of-year tests in specific skills (pages 300–310).

Addition Review

1. Turn to page 87. Then try to give the right answers to the addition facts.

Add 6 to each number below; (1) add 5; (2) add 7; (3) add 8: (4)

(1),(2) 73,72 31,30 89,88 57,56 45,44 84,83 48,47 22,21
(3),(4) **2.** 67 74,75 25 32,33 83 90,91 51 58,59 39 46,47 78 85,86 42 49,50 16 23,24

40,39 87,86 98,97 25,24 54,53 32,31 63,62 69,68
3. 34 41,42 81 88,89 92 99,100 19 26,27 48 55,56 26 33,34 57 64,65 63 70,71

62,61 78,77 24,23 43,42 61,60 71,70 90,89 55,54
4. 56 63,64 72 79,80 18 25,26 37 44,45 55 62,63 65 72,73 84 91,92 49 56,57

Copy in columns, add, and check:

5. 6 + 2 + 1 + 5 14
6. 9 + 3 + 0 + 7 19
7. 4 + 5 + 9 + 3 21
8. 7 + 2 + 6 + 5 20
9. $6.23 + $1.47 + $.98 $8.68
10. $2.17 + $.95 + $4.06 $7.18
11. $4.89 + $.65 + $3.87 $9.41
12. $4.00 + $.59 + $1.95 $6.54

13. At the store Mother spent $4.82, $1.08, and $2.75. How much in all did she spend? $8.65

14. In a game Bill got these points: 7, 8, 2, 5. What was Bill's score in the game? 22

Add these numbers and check your work:

15.

97	35	45	92	73	56	35	47
23	25	8	27	18	61	88	71
54	9	76	83	41	23	13	26
8	64	21	9	17	25	31	63
182	133	150	211	149	165	167	207

16.

116	406	564	395	495	290
571	517	384	309	47	536
687	923	948	704	542	826

17.

123	462	607	187	775	314
246	438	193	226	28	257
369	900	800	413	803	571

In using these pages, vary testing pattern. Pages 302, 304, 305, and "parts" of pages 300, 301, 306, and 309 may be done orally. Pages 303, 307, 308, and 310 should be entirely written.

1. Turn to page 88. Then try to give the right answers to the subtraction facts.

Subtract 5 from each number; (1) subtract 7; (2) subtract 10: (3)

(1), (2) 83, 81 32, 30 24, 22 60, 58 41, 39 85, 83 49, 47 58, 56
2. 88 (3) 78 37 27 29 19 65 55 46 36 90 80 54 44 63 53

68, 66 11, 9 77, 75 92, 90 16, 14 34, 32 73, 71 89, 87
3. 73 63 16 6 82 72 97 87 21 11 39 29 78 68 94 84

37, 35 65, 63 46, 44 29, 27 63, 61 90, 88 8, 6 35, 33
4. 42 32 70 60 51 41 34 24 68 58 95 85 13 3 40 30

5. Jack weighs 82 pounds. Peter weighs 76 pounds. How many more pounds does Jack weigh than Peter? 6

Subtract and check your work:

6.	98 73 27	87 80 7	100 27 73	609 386 223	405 209 196	227 163 64	\$2.80 1.56 \$1.24
7.	69 25 44	95 57 38	154 96 58	173 85 88	945 766 179	631 258 373	\$5.24 4.65 \$.59
8.	62 57 5	93 34 59	164 87 77	863 293 570	200 94 106	608 409 199	\$8.26 4.36 \$3.90
9.	71 17 54	64 33 31	139 74 65	522 299 223	115 35 80	831 184 647	\$9.10 2.12 \$6.98
10.	72 47 25	61 45 16	147 98 49	768 574 194	700 419 281	600 133 467	\$4.98 1.81 \$3.17

11. How much is 364 from 500? 136 198 from 300? 102

12. From 854 subtract 578; 276 from 251 subtract 202. 49

13. Subtract 396 from 678; 282 443 from 900; 457 208 from 693. 485

14. From \$8.00 subtract \$6.77; \$1.23 from \$3.57 take \$1.29. \$2.28

If pupils need extra summer work, as evidenced by results of tests (pages 300–310), refer them to specific pages in text or "More Practice," pages 313–326.

Reviewing Measures

1. Which is longer, 10 inches or $\frac{1}{3}$ yard? $\frac{1}{3}$ Yard

2. Which is more, 37 ounces or 2 pounds? 37 ounces

3. Which is longer, 40 minutes or $\frac{1}{2}$ hour? 40 minutes

4. Which is more, $\frac{1}{2}$ dozen rolls or 8 rolls? 8 rolls

5. Which is more, $\frac{1}{2}$ pound or 5 ounces? $\frac{1}{2}$ pound

Tell the numbers that should go in the spaces:

6. 1 hour = 30 . . . minutes
7. 1 pint = 2 . . . glasses
8. 1 yard = 36 . . . inches
9. 6 pints = 3 . . . quarts
10. 2 gallons = 8 . . . quarts
11. 9 feet = 3 . . . yards

In ex. 12 to 21, tell which of these words goes in each space. Use each word only once:

hours
pint
inches
dozen
pounds
minutes
quarts
ounces
feet
yard

12. There are 3 feet in 1 yard . . .
13. Mother baked 4 dozen . . . cookies this morning.
14. Susan is a little more than 4 feet . . . tall.
15. Bill worked 6 hours . . . last Saturday.
16. Two glasses of milk make 1 pint . . . of milk.
17. It takes Betty 5 minutes . . . to walk to school.
18. Father weighs 155 pounds . . . this spring.
19. Each week Mother buys 14 quarts . . . of milk.
20. A small candy bar weighs 3 ounces . . .
21. Peter's red crayon is 4 inches . . . long.

A Problem Test

Tell whether you add, subtract, multiply, or divide to work each problem. Then work the problem:

1. Bob paid 99¢ for 3 tickets to the movies. How much did each ticket cost? Divide; 33¢
2. This morning Betty made 50 cookies. She burned 8 cookies. How many cookies were not burned? Subtract; 42
3. Bill had 88 stamps in his book. He bought 50 more last week. Today Uncle Dick gave him 75 stamps. How many stamps has Bill now? Add; 213
4. Sally had $1.00 when she went to the store. When she came home she had $.13 left. How much money did Sally spend? Subtract; $.87
5. Father gave Ann 30¢ to buy 3-cent stamps. How many stamps did Ann get? Divide; 10
6. Roses are $4 a dozen. How much will the children pay for ½ dozen roses for Mother? Divide; $2
7. Miss White bought 2 boxes of Christmas cards. There were 25 cards in each box. How many cards did she get in 2 boxes? Multiply; 50
8. Jack gave the man a dollar to pay for a 69-cent book. How much change did the man give Jack? Subtract; $.31
9. Father and 8 children each ate a 12-cent cup of ice cream. How much did Father pay all together? Multiply: 108¢ or $1.08
10. Ann earned 75¢ today. Betty earned 55¢. How much more did Ann earn than Betty today? Subtract; 20¢

This is the last Problem Test. Did you have every problem right?

Oral Review

1. Count by 10's from 70 to 120; from 35 to 95. Count by 5's from 165 to 200. Count by 2's from 76 to 110. Count by 100's from 170 to 570. See Guide.

2. Tell what these numbers mean: 702, 3580, 4060.

3. Read these prices: \$8.65, \$4.00, \$9.06, \$.57. See Guide.

4. Which is more, $\frac{1}{3}$ of a cake or $\frac{1}{2}$ of that cake? $\frac{1}{2}$

5. Find one half of each number: $\overset{4}{8}$, $\overset{8}{16}$, $\overset{5}{10}$, $\overset{9}{18}$, $\overset{7}{14}$, $\overset{3}{6}$, $\overset{6}{12}$.

6. Tell the date of today; of a week from today.

7. Name the days of the week; the months of the year.

8. Find one third of each number: $\overset{8}{24}$, $\overset{3}{9}$, $\overset{5}{15}$, $\overset{9}{27}$, $\overset{7}{21}$.

Tell the answers. Watch the signs:

9. 24 + 4 28 87 − 4 83 79 + 6 85 14 ÷ 2 7 29 + 9 38

10. 52 + 8 60 46 + 7 53 33 + 9 42 30 − 8 22 18 ÷ 3 6

11. 36 − 5 31 80 + 9 89 91 + 8 99 17 + 5 22 25 − 7 18

12. 24 ÷ 3 8 22 − 6 16 18 ÷ 2 9 45 + 5 50 88 + 6 94

Tell the number of

13. dimes in a dollar. 10

14. quarts in a gallon. 4

15. inches in a foot. 12

16. ounces in a pound. 16

17. pints in a quart. 2

18. things in a dozen. 12

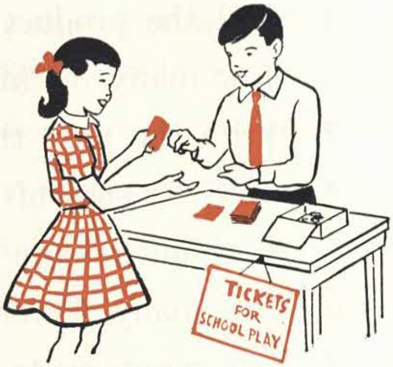
19. feet in a yard. 3

20. minutes in an hour. 60

Tell the word that should go in each space:

21. × means . . . multiply ¢ means . . . cents + means . . . add.

22. − means . . . subtract \$ means . . . dollars ÷ means . . . divide



1. Peter is selling tickets for a school play. The tickets are 19¢ for children. Susan gave Peter a half dollar. Peter gave Susan 1 penny, 1 nickel, and 1 quarter in change. As he gave her the change, he counted it like this: He began with the cost of the ticket and said "19." Then he handed her 1 penny and said "20"; next he gave her the nickel and said "25"; and then he gave her the quarter and said "50." Tell how Peter would count the change if a woman gave him 1 dollar for a 35-cent ticket. 35, 40, 50, $1.00

2. Count the change from a quarter for things that cost:
18¢ 18, 20, 25 7¢ 7, 10, 15, 25 12¢ 12, 15, 25 20¢ 20, 25 10¢ 10, 15, 25 9¢ 9, 10, 15, 25 11¢ 11, 15, 25 21¢ 21, 25

3. Count the change from 1 dollar for things that cost:
20¢ 20, 25, 50, $1.00 56¢ 56, 60, 65, 75, $1.00 37¢ 37, 40, 50, $1.00 82¢ 82, 85, 90, $1.00 70¢ 70, 75, $1.00 48¢ 48, 50, $1.00 65¢ 65, 75, $1.00

How many cents do these coins make?

4. 6 dimes 60¢

5. 9 nickels 45¢

6. 2 quarters 50¢

7. 1 dime and 4 nickels 30¢

8. 4 dimes and 1 nickel 45¢

9. 1 quarter and 6 nickels 55¢

10. 1 half dollar, 1 dime, 1 nickel, 4 pennies 69¢

11. 1 half dollar, 1 quarter, 1 nickel, 1 dime 90¢

12. 1 half dollar, 1 quarter, 1 dime, 3 pennies 88¢

13. 2 quarters, 2 dimes, 2 nickels, 2 pennies 82¢

14. 3 quarters, 1 dime, 1 nickel, 4 pennies 94¢

Mixed Practice

1. Find the product of 219 and 3. 657

2. How many 3's are there in 903? 301

3. Write the next three Roman numerals after VIII IX, X, XI

4. Find the sum of $2.38, $.96, and $1.50. $4.84

5. How much more is 700 than 238? 462

6. How many flowers are there in ½ dozen? 6

7. How many cents are there in 6 dimes? 60

8. How many dimes are there in 1 dollar? 10

9. How many minutes are there in half an hour? 30

10. How many ounces are there in half a pound? 8

11. How many inches are there in 3 yards? 108

12. Add 275 to each of these numbers:

114 389 | 403 678 | 310 585 | 600 875 | 715 990 | 492 767
525 800 | 149 424 | 468 743 | 136 411 | 697 972 | 358 633

13. Subtract 183 from each of these numbers:

498 315 | 692 509 | 337 154 | 511 328 | 196 13 | 253 70
601 418 | 380 197 | 900 717 | 572 389 | 425 242 | 250 67

14. Multiply each number by 2:

43 86 | 62 124 | 47 94 | 128 256 | 307 614 | 415 830 | 329 658
51 102 | 93 186 | 56 112 | 209 418 | 418 836 | 234 468 | 136 272

15. Divide each number by 3:

39 13 | 90 30 | 69 23 | 186 62 | 906 302 | 150 50 | 216 72
96 32 | 99 33 | 60 20 | 273 91 | 600 200 | 243 81 | 123 41
63 21 | 30 10 | 93 31 | 129 43 | 360 120 | 270 90 | 159 53

1. Turn to page 274. Try to give the right answers to the multiplication and the division facts you have learned this year.

Multiply each number by 2; $^{(1)}$ **multiply each one by 3:** $^{(2)}$

2. $\overset{(1)\ 32}{16}$ (2) 48 $\quad \overset{48}{24}$ 72 $\quad \overset{30}{15}$ 45 $\quad \overset{76}{38}$ 114 $\quad \overset{84}{42}$ 126 $\quad \overset{174}{87}$ 261 $\quad \overset{118}{59}$ 177

3. $\overset{162}{81}$ 243 $\quad \overset{94}{47}$ 141 $\quad \overset{180}{90}$ 270 $\quad \overset{126}{63}$ 189 $\quad \overset{52}{26}$ 78 $\quad \overset{140}{70}$ 210 $\quad \overset{68}{34}$ 102

Multiply. Check by going over your work:

4. $\begin{array}{r}17\\3\\\hline 51\end{array}$ $\quad \begin{array}{r}50\\2\\\hline 100\end{array}$ $\quad \begin{array}{r}121\\4\\\hline 484\end{array}$ $\quad \begin{array}{r}102\\5\\\hline 510\end{array}$ $\quad \begin{array}{r}\$4.26\\2\\\hline \$8.52\end{array}$ $\quad \begin{array}{r}\$2.24\\3\\\hline \$6.72\end{array}$

5. $\begin{array}{r}45\\2\\\hline 90\end{array}$ $\quad \begin{array}{r}43\\3\\\hline 129\end{array}$ $\quad \begin{array}{r}200\\7\\\hline 1400\end{array}$ $\quad \begin{array}{r}406\\2\\\hline 812\end{array}$ $\quad \begin{array}{r}\$1.03\\8\\\hline \$8.24\end{array}$ $\quad \begin{array}{r}\$3.28\\2\\\hline \$6.56\end{array}$

6. $\begin{array}{r}12\\9\\\hline 108\end{array}$ $\quad \begin{array}{r}18\\2\\\hline 36\end{array}$ $\quad \begin{array}{r}125\\3\\\hline 375\end{array}$ $\quad \begin{array}{r}110\\6\\\hline 660\end{array}$ $\quad \begin{array}{r}\$2.15\\3\\\hline \$6.45\end{array}$ $\quad \begin{array}{r}\$2.12\\4\\\hline \$8.48\end{array}$

7. Mother needs 70 inches of ribbon for her hat. Is this about 2 yards or about 3 yards of ribbon? About 2 ya

8. Dick and Bob shared a bag of marbles that Uncle Jim gave them. There were 100 marbles in the bag. How many marbles did each boy get? 50

Divide. Check your work by multiplying:

9. $\begin{array}{r}7\\2\overline{)14}\end{array}$ $\quad \begin{array}{r}20\\3\overline{)60}\end{array}$ $\quad \begin{array}{r}53\\3\overline{)159}\end{array}$ $\quad \begin{array}{r}53\\2\overline{)106}\end{array}$ $\quad \begin{array}{r}60\\2\overline{)120}\end{array}$ $\quad \begin{array}{r}70\\3\overline{)210}\end{array}$

10. $\begin{array}{r}9\\3\overline{)27}\end{array}$ $\quad \begin{array}{r}40\\2\overline{)80}\end{array}$ $\quad \begin{array}{r}73\\2\overline{)146}\end{array}$ $\quad \begin{array}{r}90\\3\overline{)270}\end{array}$ $\quad \begin{array}{r}101\\3\overline{)303}\end{array}$ $\quad \begin{array}{r}310\\2\overline{)620}\end{array}$

11. $\begin{array}{r}8\\3\overline{)24}\end{array}$ $\quad \begin{array}{r}9\\2\overline{)18}\end{array}$ $\quad \begin{array}{r}60\\3\overline{)180}\end{array}$ $\quad \begin{array}{r}84\\2\overline{)168}\end{array}$ $\quad \begin{array}{r}203\\3\overline{)609}\end{array}$ $\quad \begin{array}{r}42\\3\overline{)126}\end{array}$

12. $\begin{array}{r}21\\3\overline{)63}\end{array}$ $\quad \begin{array}{r}33\\2\overline{)66}\end{array}$ $\quad \begin{array}{r}43\\3\overline{)129}\end{array}$ $\quad \begin{array}{r}62\\2\overline{)124}\end{array}$ $\quad \begin{array}{r}303\\3\overline{)909}\end{array}$ $\quad \begin{array}{r}231\\2\overline{)462}\end{array}$

Review Problems

1. Jack pays 10¢ to telephone home from school. How much does he pay for 8 telephone calls? 80¢

2. Where Betty lives telephone calls cost 15¢ each. Find the cost of 2 telephone calls; 30¢ of 3 calls. 45¢

3. When Betty telephones to Grandmother, the call costs $.30. How much do 3 calls to Grandmother cost? $.90

4. Jim had 10 rabbits. He sold 3 of them. How many rabbits did Jim have then? 7

5. Last week 3 busses took 120 children to see a big farm. Each bus carried the same number of children. How many children rode in each bus? 40

6. Peggy is saving money for a new cage for her bird. The cage costs $6.49. Peggy has $4.75 now. How much more money does she need to save? $1.74

7. Peter wants to buy a 65-cent book and a 15-cent ruler. How much money does he need for these things? 80¢

8. Susan paid 60¢ for 3 cans of dog food. What was the cost of 1 can? 20¢

9. Bill had 25 tickets to sell for the ball game. Now he has only 6 left. How many tickets has Bill sold? 19

10. Ann has saved $1.75 for a ring. Today she got $5.00 for her birthday. How much has Ann now? $6.75

11. Two boys shared equally the $6 they earned cutting grass. How much money did each boy get? $3

12. At 3 for 99¢, find the cost of 1 ticket. 33¢

What Will You Do This Summer?

1. Jim will go to Grandfather's farm on July 1 and come home on September 2. How many weeks will he be on the farm? 9 Use a calendar to find the answer.

2. Betty says this summer there will be no school for 11 weeks. She will go to camp at Mountain Lake for 6 weeks. The rest of the time she will stay home. How many weeks will Betty be at home? 5

3. Bob will go to Green Lake on a bus. He will leave at 10:30 A.M. and get there at 4:30 P.M. the same day. How many hours will Bob be on the bus? 6 Look at a clock.

4. Sally has been saving money to go to White River. She needs $25 in all. Now she has $21. How much more does Sally need? $4

5. Jack has saved $3 a week for the last 9 weeks to spend this summer. How much money has Jack saved? $27

6. Uncle Tom gave Dick and Mary $60 to spend this summer. They shared the money equally. How much did each one get? $30

7. Dick will use $7 to buy a bus ticket to Sugar Hill. How much of his share will Dick have left? ↖ $23 See ex. 6.

8. Try to make a problem about something you want to do this summer. Ask the other children to work it.

Test on the Year's Work

1. Tell the answers to all the number facts on pages 87, 88, and 274.

2. Count to 100 by 10's; by 5's; by 2's.

3. Tell what these numbers mean: 493, 2800, 7006.

4. Add:

$$\begin{array}{r} 467 \\ 339 \\ \hline 806 \end{array}$$

5. Subtract:

$$\begin{array}{r} 695 \\ 368 \\ \hline 327 \end{array}$$

6. Subtract:

$$\begin{array}{r} 600 \\ 135 \\ \hline 465 \end{array}$$

7. Add:

$$\begin{array}{r} \$2.58 \\ .89 \\ 4.05 \\ \hline \$7.52 \end{array}$$

8. Multiply:

$$\begin{array}{r} 127 \\ 3 \\ \hline 381 \end{array}$$

9. Multiply:

$$\begin{array}{r} 409 \\ 2 \\ \hline 818 \end{array}$$

10. Divide:

$$\begin{array}{r} 321 \\ 2\overline{)642} \end{array}$$

11. Divide:

$$\begin{array}{r} 70 \\ 3\overline{)210} \end{array}$$

12. How many glasses are there in 3 pints of milk? 6

13. How many yards are there in 12 feet of ribbon? 4

14. How many ounces are there in 2 pounds? 32

15. Find the sum of 37, 59, 8, and 16. 120

16. Find the cost of 3 tickets at \$.75 each. \$2.25

17. At 2¢ each, how many stamps can I buy for 40¢? 20

18. Mary bought 18 post cards. She wants to keep 5 and send the others. How many cards will she send? 13

19. Bob paid \$.69 for a tie. He gave the man a dollar. How much change did Bob get? \$.31

20. Count Bob's change in two different ways. 69, 70, 75, \$1.00; 69, 70, 80, 90, \$1.00

Provide ready reference of basic addition and subtraction facts (page 312).

The 100 Addition Facts

$\begin{array}{r}0\\ 0\\ \hline 0\end{array}$	$\begin{array}{r}1\\ 0\\ \hline 1\end{array}$	$\begin{array}{r}2\\ 0\\ \hline 2\end{array}$	$\begin{array}{r}3\\ 0\\ \hline 3\end{array}$	$\begin{array}{r}4\\ 0\\ \hline 4\end{array}$	$\begin{array}{r}5\\ 0\\ \hline 5\end{array}$	$\begin{array}{r}6\\ 0\\ \hline 6\end{array}$	$\begin{array}{r}7\\ 0\\ \hline 7\end{array}$	$\begin{array}{r}8\\ 0\\ \hline 8\end{array}$	$\begin{array}{r}9\\ 0\\ \hline 9\end{array}$
$\begin{array}{r}0\\ 1\\ \hline 1\end{array}$	$\begin{array}{r}1\\ 1\\ \hline 2\end{array}$	$\begin{array}{r}2\\ 1\\ \hline 3\end{array}$	$\begin{array}{r}3\\ 1\\ \hline 4\end{array}$	$\begin{array}{r}4\\ 1\\ \hline 5\end{array}$	$\begin{array}{r}5\\ 1\\ \hline 6\end{array}$	$\begin{array}{r}6\\ 1\\ \hline 7\end{array}$	$\begin{array}{r}7\\ 1\\ \hline 8\end{array}$	$\begin{array}{r}8\\ 1\\ \hline 9\end{array}$	$\begin{array}{r}9\\ 1\\ \hline 10\end{array}$
$\begin{array}{r}0\\ 2\\ \hline 2\end{array}$	$\begin{array}{r}1\\ 2\\ \hline 3\end{array}$	$\begin{array}{r}2\\ 2\\ \hline 4\end{array}$	$\begin{array}{r}3\\ 2\\ \hline 5\end{array}$	$\begin{array}{r}4\\ 2\\ \hline 6\end{array}$	$\begin{array}{r}5\\ 2\\ \hline 7\end{array}$	$\begin{array}{r}6\\ 2\\ \hline 8\end{array}$	$\begin{array}{r}7\\ 2\\ \hline 9\end{array}$	$\begin{array}{r}8\\ 2\\ \hline 10\end{array}$	$\begin{array}{r}9\\ 2\\ \hline 11\end{array}$
$\begin{array}{r}0\\ 3\\ \hline 3\end{array}$	$\begin{array}{r}1\\ 3\\ \hline 4\end{array}$	$\begin{array}{r}2\\ 3\\ \hline 5\end{array}$	$\begin{array}{r}3\\ 3\\ \hline 6\end{array}$	$\begin{array}{r}4\\ 3\\ \hline 7\end{array}$	$\begin{array}{r}5\\ 3\\ \hline 8\end{array}$	$\begin{array}{r}6\\ 3\\ \hline 9\end{array}$	$\begin{array}{r}7\\ 3\\ \hline 10\end{array}$	$\begin{array}{r}8\\ 3\\ \hline 11\end{array}$	$\begin{array}{r}9\\ 3\\ \hline 12\end{array}$
$\begin{array}{r}0\\ 4\\ \hline 4\end{array}$	$\begin{array}{r}1\\ 4\\ \hline 5\end{array}$	$\begin{array}{r}2\\ 4\\ \hline 6\end{array}$	$\begin{array}{r}3\\ 4\\ \hline 7\end{array}$	$\begin{array}{r}4\\ 4\\ \hline 8\end{array}$	$\begin{array}{r}5\\ 4\\ \hline 9\end{array}$	$\begin{array}{r}6\\ 4\\ \hline 10\end{array}$	$\begin{array}{r}7\\ 4\\ \hline 11\end{array}$	$\begin{array}{r}8\\ 4\\ \hline 12\end{array}$	$\begin{array}{r}9\\ 4\\ \hline 13\end{array}$
$\begin{array}{r}0\\ 5\\ \hline 5\end{array}$	$\begin{array}{r}1\\ 5\\ \hline 6\end{array}$	$\begin{array}{r}2\\ 5\\ \hline 7\end{array}$	$\begin{array}{r}3\\ 5\\ \hline 8\end{array}$	$\begin{array}{r}4\\ 5\\ \hline 9\end{array}$	$\begin{array}{r}5\\ 5\\ \hline 10\end{array}$	$\begin{array}{r}6\\ 5\\ \hline 11\end{array}$	$\begin{array}{r}7\\ 5\\ \hline 12\end{array}$	$\begin{array}{r}8\\ 5\\ \hline 13\end{array}$	$\begin{array}{r}9\\ 5\\ \hline 14\end{array}$
$\begin{array}{r}0\\ 6\\ \hline 6\end{array}$	$\begin{array}{r}1\\ 6\\ \hline 7\end{array}$	$\begin{array}{r}2\\ 6\\ \hline 8\end{array}$	$\begin{array}{r}3\\ 6\\ \hline 9\end{array}$	$\begin{array}{r}4\\ 6\\ \hline 10\end{array}$	$\begin{array}{r}5\\ 6\\ \hline 11\end{array}$	$\begin{array}{r}6\\ 6\\ \hline 12\end{array}$	$\begin{array}{r}7\\ 6\\ \hline 13\end{array}$	$\begin{array}{r}8\\ 6\\ \hline 14\end{array}$	$\begin{array}{r}9\\ 6\\ \hline 15\end{array}$
$\begin{array}{r}0\\ 7\\ \hline 7\end{array}$	$\begin{array}{r}1\\ 7\\ \hline 8\end{array}$	$\begin{array}{r}2\\ 7\\ \hline 9\end{array}$	$\begin{array}{r}3\\ 7\\ \hline 10\end{array}$	$\begin{array}{r}4\\ 7\\ \hline 11\end{array}$	$\begin{array}{r}5\\ 7\\ \hline 12\end{array}$	$\begin{array}{r}6\\ 7\\ \hline 13\end{array}$	$\begin{array}{r}7\\ 7\\ \hline 14\end{array}$	$\begin{array}{r}8\\ 7\\ \hline 15\end{array}$	$\begin{array}{r}9\\ 7\\ \hline 16\end{array}$
$\begin{array}{r}0\\ 8\\ \hline 8\end{array}$	$\begin{array}{r}1\\ 8\\ \hline 9\end{array}$	$\begin{array}{r}2\\ 8\\ \hline 10\end{array}$	$\begin{array}{r}3\\ 8\\ \hline 11\end{array}$	$\begin{array}{r}4\\ 8\\ \hline 12\end{array}$	$\begin{array}{r}5\\ 8\\ \hline 13\end{array}$	$\begin{array}{r}6\\ 8\\ \hline 14\end{array}$	$\begin{array}{r}7\\ 8\\ \hline 15\end{array}$	$\begin{array}{r}8\\ 8\\ \hline 16\end{array}$	$\begin{array}{r}9\\ 8\\ \hline 17\end{array}$
$\begin{array}{r}0\\ 9\\ \hline 9\end{array}$	$\begin{array}{r}1\\ 9\\ \hline 10\end{array}$	$\begin{array}{r}2\\ 9\\ \hline 11\end{array}$	$\begin{array}{r}3\\ 9\\ \hline 12\end{array}$	$\begin{array}{r}4\\ 9\\ \hline 13\end{array}$	$\begin{array}{r}5\\ 9\\ \hline 14\end{array}$	$\begin{array}{r}6\\ 9\\ \hline 15\end{array}$	$\begin{array}{r}7\\ 9\\ \hline 16\end{array}$	$\begin{array}{r}8\\ 9\\ \hline 17\end{array}$	$\begin{array}{r}9\\ 9\\ \hline 18\end{array}$

Facts are listed in sequential order so that pupils may see relationships which exist between them. Be sure to point out these relationships.

The 100 Subtraction Facts

$\begin{array}{r}0\\0\\\hline 0\end{array}$	$\begin{array}{r}1\\0\\\hline 1\end{array}$	$\begin{array}{r}2\\0\\\hline 2\end{array}$	$\begin{array}{r}3\\0\\\hline 3\end{array}$	$\begin{array}{r}4\\0\\\hline 4\end{array}$	$\begin{array}{r}5\\0\\\hline 5\end{array}$	$\begin{array}{r}6\\0\\\hline 6\end{array}$	$\begin{array}{r}7\\0\\\hline 7\end{array}$	$\begin{array}{r}8\\0\\\hline 8\end{array}$	$\begin{array}{r}9\\0\\\hline 9\end{array}$
$\begin{array}{r}1\\1\\\hline 0\end{array}$	$\begin{array}{r}2\\1\\\hline 1\end{array}$	$\begin{array}{r}3\\1\\\hline 2\end{array}$	$\begin{array}{r}4\\1\\\hline 3\end{array}$	$\begin{array}{r}5\\1\\\hline 4\end{array}$	$\begin{array}{r}6\\1\\\hline 5\end{array}$	$\begin{array}{r}7\\1\\\hline 6\end{array}$	$\begin{array}{r}8\\1\\\hline 7\end{array}$	$\begin{array}{r}9\\1\\\hline 8\end{array}$	$\begin{array}{r}10\\1\\\hline 9\end{array}$
$\begin{array}{r}2\\2\\\hline 0\end{array}$	$\begin{array}{r}3\\2\\\hline 1\end{array}$	$\begin{array}{r}4\\2\\\hline 2\end{array}$	$\begin{array}{r}5\\2\\\hline 3\end{array}$	$\begin{array}{r}6\\2\\\hline 4\end{array}$	$\begin{array}{r}7\\2\\\hline 5\end{array}$	$\begin{array}{r}8\\2\\\hline 6\end{array}$	$\begin{array}{r}9\\2\\\hline 7\end{array}$	$\begin{array}{r}10\\2\\\hline 8\end{array}$	$\begin{array}{r}11\\2\\\hline 9\end{array}$
$\begin{array}{r}3\\3\\\hline 0\end{array}$	$\begin{array}{r}4\\3\\\hline 1\end{array}$	$\begin{array}{r}5\\3\\\hline 2\end{array}$	$\begin{array}{r}6\\3\\\hline 3\end{array}$	$\begin{array}{r}7\\3\\\hline 4\end{array}$	$\begin{array}{r}8\\3\\\hline 5\end{array}$	$\begin{array}{r}9\\3\\\hline 6\end{array}$	$\begin{array}{r}10\\3\\\hline 7\end{array}$	$\begin{array}{r}11\\3\\\hline 8\end{array}$	$\begin{array}{r}12\\3\\\hline 9\end{array}$
$\begin{array}{r}4\\4\\\hline 0\end{array}$	$\begin{array}{r}5\\4\\\hline 1\end{array}$	$\begin{array}{r}6\\4\\\hline 2\end{array}$	$\begin{array}{r}7\\4\\\hline 3\end{array}$	$\begin{array}{r}8\\4\\\hline 4\end{array}$	$\begin{array}{r}9\\4\\\hline 5\end{array}$	$\begin{array}{r}10\\4\\\hline 6\end{array}$	$\begin{array}{r}11\\4\\\hline 7\end{array}$	$\begin{array}{r}12\\4\\\hline 8\end{array}$	$\begin{array}{r}13\\4\\\hline 9\end{array}$
$\begin{array}{r}5\\5\\\hline 0\end{array}$	$\begin{array}{r}6\\5\\\hline 1\end{array}$	$\begin{array}{r}7\\5\\\hline 2\end{array}$	$\begin{array}{r}8\\5\\\hline 3\end{array}$	$\begin{array}{r}9\\5\\\hline 4\end{array}$	$\begin{array}{r}10\\5\\\hline 5\end{array}$	$\begin{array}{r}11\\5\\\hline 6\end{array}$	$\begin{array}{r}12\\5\\\hline 7\end{array}$	$\begin{array}{r}13\\5\\\hline 8\end{array}$	$\begin{array}{r}14\\5\\\hline 9\end{array}$
$\begin{array}{r}6\\6\\\hline 0\end{array}$	$\begin{array}{r}7\\6\\\hline 1\end{array}$	$\begin{array}{r}8\\6\\\hline 2\end{array}$	$\begin{array}{r}9\\6\\\hline 3\end{array}$	$\begin{array}{r}10\\6\\\hline 4\end{array}$	$\begin{array}{r}11\\6\\\hline 5\end{array}$	$\begin{array}{r}12\\6\\\hline 6\end{array}$	$\begin{array}{r}13\\6\\\hline 7\end{array}$	$\begin{array}{r}14\\6\\\hline 8\end{array}$	$\begin{array}{r}15\\6\\\hline 9\end{array}$
$\begin{array}{r}7\\7\\\hline 0\end{array}$	$\begin{array}{r}8\\7\\\hline 1\end{array}$	$\begin{array}{r}9\\7\\\hline 2\end{array}$	$\begin{array}{r}10\\7\\\hline 3\end{array}$	$\begin{array}{r}11\\7\\\hline 4\end{array}$	$\begin{array}{r}12\\7\\\hline 5\end{array}$	$\begin{array}{r}13\\7\\\hline 6\end{array}$	$\begin{array}{r}14\\7\\\hline 7\end{array}$	$\begin{array}{r}15\\7\\\hline 8\end{array}$	$\begin{array}{r}16\\7\\\hline 9\end{array}$
$\begin{array}{r}8\\8\\\hline 0\end{array}$	$\begin{array}{r}9\\8\\\hline 1\end{array}$	$\begin{array}{r}10\\8\\\hline 2\end{array}$	$\begin{array}{r}11\\8\\\hline 3\end{array}$	$\begin{array}{r}12\\8\\\hline 4\end{array}$	$\begin{array}{r}13\\8\\\hline 5\end{array}$	$\begin{array}{r}14\\8\\\hline 6\end{array}$	$\begin{array}{r}15\\8\\\hline 7\end{array}$	$\begin{array}{r}16\\8\\\hline 8\end{array}$	$\begin{array}{r}17\\8\\\hline 9\end{array}$
$\begin{array}{r}9\\9\\\hline 0\end{array}$	$\begin{array}{r}10\\9\\\hline 1\end{array}$	$\begin{array}{r}11\\9\\\hline 2\end{array}$	$\begin{array}{r}12\\9\\\hline 3\end{array}$	$\begin{array}{r}13\\9\\\hline 4\end{array}$	$\begin{array}{r}14\\9\\\hline 5\end{array}$	$\begin{array}{r}15\\9\\\hline 6\end{array}$	$\begin{array}{r}16\\9\\\hline 7\end{array}$	$\begin{array}{r}17\\9\\\hline 8\end{array}$	$\begin{array}{r}18\\9\\\hline 9\end{array}$

Pages 313–326 provide practice material in addition, subtraction, multiplication, and division.

More Practice

①

1.	31¢ +36¢ 67¢	54¢ +23¢ 77¢	25¢ +74¢ 99¢	42¢ +47¢ 89¢	13¢ +85¢ 98¢	41¢ +36¢ 77¢	23¢ +53¢ 76¢
2.	75¢ +21¢ 96¢	34¢ +42¢ 76¢	52¢ +34¢ 86¢	36¢ +22¢ 58¢	42¢ +15¢ 57¢	68¢ +31¢ 99¢	52¢ +43¢ 95¢
3.	36¢ +51¢ 87¢	21¢ +43¢ 64¢	12¢ +32¢ 44¢	46¢ +23¢ 69¢	24¢ +24¢ 48¢	61¢ +15¢ 76¢	31¢ +18¢ 49¢

②

4.	62 +34 96	72 +24 96	13 +45 58	27 +51 78	44 +43 87	15 +34 49	23 +62 85
5.	34 +31 65	26 +72 98	56 +21 77	11 +25 36	13 +76 89	11 +53 64	45 +52 97
6.	23 +24 47	42 +37 79	38 +41 79	13 +63 76	52 +46 98	37 +22 59	55 +33 88

③

7.	79¢ −16¢ 63¢	88¢ −31¢ 57¢	44¢ −21¢ 23¢	92¢ −71¢ 21¢	47¢ −32¢ 15¢	98¢ −24¢ 74¢	85¢ −63¢ 22¢
8.	65¢ −44¢ 21¢	89¢ −27¢ 62¢	66¢ −14¢ 52¢	39¢ −23¢ 16¢	84¢ −42¢ 42¢	53¢ −32¢ 21¢	73¢ −51¢ 22¢
9.	96¢ −45¢ 51¢	65¢ −22¢ 43¢	79¢ −34¢ 45¢	66¢ −33¢ 33¢	58¢ −22¢ 36¢	57¢ −43¢ 14¢	78¢ −45¢ 33¢
10.	54¢ −13¢ 41¢	65¢ −54¢ 11¢	96¢ −62¢ 34¢	38¢ −13¢ 25¢	99¢ −52¢ 47¢	94¢ −32¢ 62¢	77¢ −46¢ 31¢

These pages are correlated with ones throughout the text. Use for individual pupil assistance, review and reinforcement of processes, reteaching, and so on.

More Practice

4

1.	98 − 52 46	68 − 25 43	76 − 45 31	54 − 22 32	97 − 63 34	58 − 43 15	39 − 11 28
2.	46 − 12 34	94 − 43 51	57 − 15 42	85 − 54 31	76 − 33 43	95 − 81 14	63 − 51 12
3.	77 − 32 45	59 − 14 45	67 − 26 41	49 − 23 26	56 − 44 12	89 − 42 47	95 − 42 53
4.	69 − 18 51	59 − 37 22	94 − 52 42	88 − 17 71	69 − 42 27	87 − 61 26	53 − 22 31

5

5.	5 3 + 1 9	1 6 + 1 8	4 1 + 3 8	4 4 + 2 10	3 3 + 2 8	1 3 + 5 9	1 6 + 3 10	2 1 + 6 9	3 4 + 3 10
6.	3 1 + 5 9	4 2 + 4 10	2 5 + 1 8	1 3 + 3 7	4 4 + 1 9	6 2 + 1 9	1 7 + 2 10	6 2 + 2 10	8 1 + 1 10

6

7.	74 + 75 149	61 + 57 118	93 + 84 177	72 + 86 158	93 + 15 108	61 + 45 106	64 + 64 128
8.	81 + 26 107	62 + 75 137	85 + 84 169	71 + 68 139	87 + 71 158	93 + 96 189	84 + 93 177
9.	53 + 23 76	42 + 47 89	25 + 73 98	53 + 41 94	36 + 23 59	45 + 32 77	37 + 32 69
10.	74 + 31 105	42 + 64 106	23 + 42 65	61 + 65 126	74 + 62 136	82 + 73 155	82 + 92 174

⑦

1.	146 −71 75	128 −64 64	119 −55 64	145 −73 72	164 −82 82	138 −76 62	149 −74 75
2.	179 −86 93	148 −75 73	157 −74 83	124 −61 63	116 −65 51	186 −92 94	135 −74 61
3.	116 −53 63	139 −62 77	107 −41 66	169 −88 81	177 −95 82	159 −87 72	108 −51 57
4.	136 −64 72	167 −83 84	149 −75 74	127 −62 65	158 −86 72	118 −65 53	154 −71 83

⑧

5.	2 7 +2 11	7 2 +4 13	7 1 +7 15	2 3 +6 11	4 5 +1 10	7 2 +7 16	5 1 +5 11	6 3 +3 12	2 4 +5 11
6.	3 3 +6 12	2 4 +4 10	5 2 +7 14	6 1 +6 13	7 2 +5 14	6 3 +6 15	4 2 +7 13	7 1 +8 16	6 1 +8 15

⑨

7.	65 +72 137	63 +96 159	64 +64 128	33 +81 114	73 +63 136	75 +34 109	96 +81 177
8.	61 +83 144	23 +93 116	82 +43 125	91 +32 123	81 +67 148	54 +83 137	91 +45 136
9.	88 +91 179	94 +62 156	47 +61 108	82 +55 137	81 +74 155	42 +84 126	84 +35 119
10.	72 +86 158	93 +54 147	86 +83 169	75 +91 166	61 +48 109	93 +92 185	56 +52 108

More Practice

⑩

1.	72	71	90	33	91	66	85
	+91	+86	+51	+82	+84	+82	+40
	163	157	141	115	175	148	125
2.	74	45	73	74	92	27	52
	+74	+63	+44	+51	+15	+92	+74
	148	108	117	125	107	119	126
3.	70	95	96	94	67	52	53
	+63	+94	+33	+72	+50	+96	+81
	133	189	129	166	117	148	134

⑪

4.	119	117	147	138	167	118	124
	−97	−83	−87	−92	−85	−63	−80
	22	34	60	46	82	55	44
5.	157	119	157	139	175	136	126
	−80	−28	−66	−85	−83	−75	−96
	77	91	91	54	92	61	30
6.	117	136	109	158	189	146	168
	−74	−63	−36	−66	−99	−94	−77
	43	73	73	92	90	52	91

⑫

7.	664	510	214	221	155	263
	+234	+346	+253	+762	+831	+511
	898	856	467	983	986	774
8.	432	124	301	453	250	123
	+537	+745	+636	+146	+629	+525
	969	869	937	599	879	648
9.	634	532	326	143	417	143
	+342	+253	+473	+624	+382	+133
	976	785	799	767	799	276
10.	242	205	412	373	121	406
	+455	+343	+436	+122	+255	+292
	697	548	848	495	376	698

⑬

1.	5	7	4	6	6	5	4	3	3
	4	2	5	2	3	3	4	5	1
	+4	+4	+3	+5	+2	+3	+3	+3	+7
	13	13	12	13	11	11	11	11	11
2.	5	3	8	4	5	6	6	8	6
	4	4	1	4	4	2	1	1	3
	+2	+4	+5	+4	+3	+4	+7	+2	+6
	11	11	14	12	12	12	14	11	15

⑭

3.	67	99	64	128	117	148	117
	−56	−75	−41	−54	−73	−78	−82
	11	24	23	74	44	70	35
4.	98	73	95	109	158	134	128
	−63	−22	−43	−88	−66	−53	−60
	35	51	52	21	92	81	68
5.	99	86	77	126	176	117	151
	−37	−53	−35	−91	−90	−94	−81
	62	33	42	35	86	23	70
6.	66	59	78	149	118	139	119
	−24	−49	−65	−86	−47	−74	−63
	42	10	13	63	71	65	56

⑮

7.	878	679	757	985	576	655
	−543	−261	−105	−565	−254	−334
	335	418	652	420	322	321
8.	499	682	847	349	968	985
	−275	−542	−133	−216	−432	−101
	224	140	714	133	536	884
9.	389	756	885	597	686	985
	−134	−342	−422	−382	−475	−314
	255	414	463	215	211	671
10.	798	746	288	943	725	849
	−478	−221	−156	−612	−621	−733
	320	525	132	331	104	116

More Practice

⑯

1.	58	47	67	594	488	869	684
	−53	−43	−4	−93	−26	−862	−654
	5	4	63	501	462	7	30
2.	86	29	79	907	896	389	786
	−4	−23	−76	−901	−52	−48	−781
	82	6	3	6	844	341	5
3.	37	49	95	465	566	782	157
	−35	−4	−94	−162	−53	−742	−152
	2	45	1	303	513	40	5
4.	39	55	75	227	998	464	837
	−37	−51	−3	−26	−17	−462	−827
	2	4	72	201	981	2	10

⑰

5.	6	5	2	4	3	8	6	7	8
	5	6	8	7	9	4	8	3	6
	+7	+4	+5	+3	+7	+7	+3	+9	+4
	18	15	15	14	19	19	17	19	18
6.	7	8	5	6	4	3	7	5	9
	6	8	8	6	9	8	8	9	7
	+5	+3	+6	+7	+3	+5	+4	+4	+3
	18	19	19	19	16	16	19	18	19

⑱

7.	2	6	5	9	7	4	2	9	4
	7	8	4	6	9	5	7	4	7
	+5	+1	+8	+3	+2	+9	+6	+5	+4
	14	15	17	18	18	18	15	18	15
8.	6	8	9	7	8	5	8	4	7
	9	5	8	7	2	7	7	8	4
	+2	+5	+2	+5	+6	+6	+3	+6	+5
	17	18	19	19	16	18	18	18	16
9.	8	9	3	5	6	8	5	7	9
	3	5	7	5	7	9	4	5	3
	+6	+5	+6	+4	+6	+2	+9	+6	+5
	17	19	16	14	19	19	18	18	17

19

1.	4	8	5	9	6	3	5	0	7
	0	3	8	6	2	6	7	6	5
	7	5	4	6	5	8	6	9	7
	+5	+4	+3	+2	+9	+5	+4	+6	+6
	16	20	20	23	22	22	22	21	25
2.	1	8	2	0	7	7	3	5	4
	6	1	5	8	5	4	6	7	8
	2	5	9	7	9	8	9	9	4
	+7	+8	+7	+9	+3	+1	+8	+5	+5
	16	22	23	24	24	20	26	26	21
3.	7	5	3	9	6	2	5	4	8
	6	4	9	7	3	9	6	7	4
	3	8	5	0	7	6	6	4	0
	+5	+6	+8	+6	+4	+7	+9	+8	+9
	21	23	25	22	20	24	26	23	21
4.	6	2	9	3	8	5	4	7	8
	5	7	3	0	6	9	9	7	2
	4	6	8	8	5	1	4	8	3
	+7	+5	+4	+9	+6	+7	+6	+4	+8
	22	20	24	20	25	22	23	26	21

20

5.	17	25	24	47	74	33	68	18
	+57	+49	+67	+35	+16	+38	+19	+42
	74	74	91	82	90	71	87	60
6.	19	38	42	58	56	26	45	64
	+25	+27	+19	+26	+35	+59	+47	+29
	44	65	61	84	91	85	92	93
7.	46	27	17	18	79	24	38	39
	+29	+13	+59	+77	+16	+27	+16	+48
	75	40	76	95	95	51	54	87
8.	16	52	68	24	69	17	35	17
	+47	+19	+12	+36	+25	+35	+59	+67
	63	71	80	60	94	52	94	84

More Practice

㉑

1.	37	49	58	73	98	37	97	67
	+83	+54	+66	+27	+34	+69	+56	+58
	120	103	124	100	132	106	153	125
2.	47	22	89	71	26	65	95	62
	+77	+79	+55	+39	+84	+86	+45	+68
	124	101	144	110	110	151	140	130
3.	96	48	59	95	78	58	95	49
	+68	+88	+59	+78	+59	+43	+87	+72
	164	136	118	173	137	101	182	121
4.	46	58	74	69	68	73	66	78
	+96	+97	+46	+41	+72	+89	+39	+75
	142	155	120	110	140	162	105	153

㉒

5.	26	41	97	93	42	78	49	28
	78	59	32	78	47	74	36	97
	+12	+44	+43	+11	+54	+25	+68	+24
	116	144	172	182	143	177	153	149
6.	47	57	38	96	83	42	74	19
	21	59	79	86	36	58	69	69
	+37	+52	+56	+13	+57	+37	+19	+16
	105	168	173	195	176	137	162	104
7.	85	27	72	45	95	49	57	75
	50	63	47	76	69	84	98	41
	+39	+34	+26	+45	+32	+34	+37	+64
	174	124	145	166	196	167	192	180
8.	14	29	36	67	82	89	56	54
	46	23	97	18	68	30	79	83
	+27	+25	+66	+43	+15	+68	+21	+39
	87	77	199	128	165	187	156	176
9.	38	37	22	56	47	58	49	57
	24	35	49	27	65	72	68	46
	+32	+18	+24	+65	+43	+39	+17	+56
	94	90	95	148	155	169	134	159

23

1.	38	67	9	48	55	28	63
	8	18	44	37	8	23	6
	+46	+9	+17	+6	+17	+9	+17
	92	94	70	91	80	60	86
2.	35	28	9	28	20	16	9
	9	23	25	63	9	63	14
	+34	+8	+54	+5	+45	+7	+74
	78	59	88	96	74	86	97

24

3.	84¢	76¢	44¢	83¢	98¢	61¢	60¢
	−45¢	−29¢	−36¢	−57¢	−29¢	−43¢	−54¢
	39¢	47¢	8¢	26¢	69¢	18¢	6¢
4.	63¢	82¢	95¢	70¢	83¢	72¢	52¢
	−34¢	−27¢	−58¢	−33¢	−65¢	−18¢	−16¢
	29¢	55¢	37¢	37¢	18¢	54¢	36¢
5.	75¢	41¢	63¢	61¢	75¢	60¢	57¢
	−36¢	−15¢	−49¢	−56¢	−27¢	−32¢	−29¢
	39¢	26¢	14¢	5¢	48¢	28¢	28¢

25

6.	47	86	50	155	132	134	144
	−19	−17	−36	−86	−75	−65	−76
	28	69	14	69	57	69	68
7.	52	30	85	126	131	131	122
	−47	−15	−58	−58	−47	−59	−33
	5	15	27	68	84	72	89
8.	91	63	56	160	118	120	171
	−78	−34	−17	−75	−79	−63	−94
	13	29	39	85	39	57	77
9.	97	75	60	154	142	131	110
	−48	−29	−58	−67	−99	−82	−42
	49	46	2	87	43	49	68
10.	73	95	74	122	143	162	100
	−38	−59	−59	−78	−65	−66	−39
	35	36	15	44	78	96	61

More Practice

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1.	71	75	61	94	73	70	51
	−44	−38	−56	−37	−29	−66	−42
	27	37	5	57	44	4	9
2.	40	82	77	86	91	31	94
	−37	−44	−59	−28	−85	−23	−49
	3	38	18	58	6	8	45
3.	70	90	45	80	77	20	90
	−61	−25	−37	−78	−49	−13	−72
	9	65	8	2	28	7	18

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4.	$6.38	$7.48	$1.14	$2.47	$3.07	$2.49
	+2.29	+1.24	+3.76	+3.47	+2.58	+5.36
	$8.67	$8.72	$4.90	$5.94	$5.65	$7.85
5.	$5.32	$2.34	$4.08	$5.25	$5.16	$2.06
	+1.58	+6.49	+1.63	+4.17	+3.16	+1.78
	$6.90	$8.83	$5.71	$9.42	$8.32	$3.84
6.	$7.13	$6.19	$2.45	$1.07	$5.15	$3.89
	+2.47	+1.59	+4.15	+4.26	+2.69	+4.03
	$9.60	$7.78	$6.60	$5.33	$7.84	$7.92

㉘

7.	$2.45	$3.90	$4.83	$2.66	$6.68	$1.90
	+6.84	+4.57	+1.84	+3.93	+2.40	+7.35
	$9.29	$8.47	$6.67	$6.59	$9.08	$9.25
8.	$1.83	$2.83	$5.84	$1.30	$3.54	$2.92
	+2.92	+5.31	+2.53	+4.76	+2.74	+1.63
	$4.75	$8.14	$8.37	$6.06	$6.28	$4.55
9.	$5.52	$4.92	$2.45	$7.66	$6.68	$1.90
	+3.96	+2.22	+2.93	+1.52	+2.40	+7.35
	$9.48	$7.14	$5.38	$9.18	$9.08	$9.25
10.	$1.71	$3.32	$6.94	$1.40	$4.84	$3.73
	+1.94	+3.85	+1.41	+5.63	+3.45	+1.66
	$3.65	$7.17	$8.35	$7.03	$8.29	$5.39

㉙

1.	356 +257 613	399 +102 501	648 +179 827	287 +347 634	578 +176 754	467 +345 812
2.	169 +489 658	298 +223 521	474 +257 731	165 +759 924	238 +168 406	439 +484 923
3.	597 +259 856	247 +483 730	184 +636 820	357 +364 721	452 +179 631	251 +649 900
4.	398 +477 875	536 +378 914	168 +132 300	129 +375 504	157 +243 400	479 +477 956

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5.	48¢ 73¢ +26¢ $1.47	98¢ 19¢ +23¢ $1.40	66¢ 16¢ +49¢ $1.31	39¢ 41¢ +58¢ $1.38	63¢ 74¢ +35¢ $1.72	80¢ 28¢ +26¢ $1.34	83¢ 44¢ +33¢ $1.60
6.	68¢ 72¢ +29¢ $1.69	33¢ 19¢ +66¢ $1.18	95¢ 95¢ +16¢ $2.06	71¢ 32¢ +17¢ $1.20	90¢ 19¢ +27¢ $1.36	68¢ 27¢ +47¢ $1.42	84¢ 25¢ +42¢ $1.51

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7.	$9.64 −2.56 $7.08	$5.97 −2.39 $3.58	$9.74 −5.45 $4.29	$9.72 −8.13 $1.59	$7.80 −1.67 $6.13	$6.42 −3.36 $3.06
8.	$4.75 −3.49 $1.26	$8.85 −6.47 $2.38	$8.21 −7.06 $1.15	$5.63 −3.49 $2.14	$6.54 −4.37 $2.17	$9.81 −6.19 $3.62
9.	$9.42 −3.17 $6.25	$5.72 −1.24 $4.48	$8.95 −4.88 $4.07	$9.40 −7.36 $2.04	$9.41 −4.25 $5.16	$8.13 −3.07 $5.06
10.	$6.83 −6.05 $ .78	$7.40 −6.13 $1.27	$7.71 −2.37 $5.34	$9.66 −9.59 $ .07	$7.40 −3.05 $4.35	$4.64 −4.28 $ .36

More Practice

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1.	$4.05	$8.76	$9.59	$8.38	$8.17	$6.09
	− 1.63	−6.93	−7.84	−5.43	−3.31	−2.43
	$2.42	$1.83	$1.75	$2.95	$4.86	$3.66
2.	$9.28	$6.39	$9.57	$4.36	$4.66	$5.49
	−5.52	−4.97	−6.67	−3.62	− 1.75	−4.82
	$3.76	$1.42	$2.90	$ .74	$2.91	$ .67
3.	$7.56	$7.38	$4.67	$9.47	$7.29	$3.48
	− 1.74	−5.85	−2.94	−3.52	−3.65	−2.94
	$5.82	$1.53	$1.73	$5.95	$3.64	$ .54

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4.	821	442	873	731	945	311
	−552	−253	−698	−246	−698	− 164
	269	189	175	485	247	147
5.	612	894	815	933	752	957
	−499	−296	−439	−386	−495	−758
	113	598	376	547	257	199
6.	564	526	737	611	810	513
	−368	−288	−369	−253	−321	−444
	196	238	368	358	489	69

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7.	800	903	652	800	203	900
	−366	−259	−393	−273	− 156	−734
	434	644	259	527	47	166
8.	200	700	704	300	825	606
	− 146	−311	−568	− 195	−597	−437
	54	389	136	105	228	169
9.	712	600	913	706	900	700
	− 175	−242	−438	−689	−591	−226
	537	358	475	17	309	474
10.	500	825	800	754	400	901
	−253	−489	−377	−476	−288	−667
	247	336	423	278	112	234

㉟

1.	36 +49 85	60 −27 33	63 −39 24	353 +426 779	506 −271 235	442 −124 318
2.	84 −77 7	24 +46 70	19 +49 68	840 −241 599	187 +125 312	165 +279 444
3.	36 +29 65	43 −35 8	95 −26 69	448 +448 896	737 −289 448	695 −438 257

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4.	24 ×2 48	33 ×2 66	42 ×2 84	11 ×2 22	132 ×2 264	114 ×2 228	232 ×2 464
5.	43 ×2 86	22 ×2 44	13 ×2 26	44 ×2 88	431 ×2 862	312 ×2 624	434 ×2 868
6.	32 ×2 64	41 ×2 82	23 ×2 46	34 ×2 68	243 ×2 486	412 ×2 824	341 ×2 682

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7.	218 ×3 654	148 ×2 296	436 ×2 872	200 ×3 600	324 ×3 972	319 ×2 638
8.	235 ×2 470	203 ×4 812	127 ×3 381	102 ×6 612	126 ×3 378	409 ×2 818
9.	112 ×7 784	306 ×3 918	327 ×2 654	113 ×5 565	207 ×2 414	109 ×3 327
10.	618 ×2 1236	907 ×3 2721	415 ×3 1245	719 ×2 1438	203 ×8 1624	518 ×3 1554

More Practice

㊳

1.	$\begin{array}{r}29\\\times4\\\hline116\end{array}$	$\begin{array}{r}71\\\times4\\\hline284\end{array}$	$\begin{array}{r}36\\\times4\\\hline144\end{array}$	$\begin{array}{r}94\\\times4\\\hline376\end{array}$	$\begin{array}{r}117\\\times4\\\hline468\end{array}$	$\begin{array}{r}205\\\times4\\\hline820\end{array}$
2.	$\begin{array}{r}52\\\times4\\\hline208\end{array}$	$\begin{array}{r}18\\\times4\\\hline72\end{array}$	$\begin{array}{r}45\\\times4\\\hline180\end{array}$	$\begin{array}{r}60\\\times4\\\hline240\end{array}$	$\begin{array}{r}124\\\times4\\\hline496\end{array}$	$\begin{array}{r}213\\\times4\\\hline852\end{array}$
3.	$\begin{array}{r}14\\\times9\\\hline126\end{array}$	$\begin{array}{r}42\\\times7\\\hline294\end{array}$	$\begin{array}{r}24\\\times5\\\hline120\end{array}$	$\begin{array}{r}83\\\times4\\\hline332\end{array}$	$\begin{array}{r}104\\\times6\\\hline624\end{array}$	$\begin{array}{r}116\\\times4\\\hline464\end{array}$
4.	$\begin{array}{r}37\\\times4\\\hline148\end{array}$	$\begin{array}{r}89\\\times4\\\hline356\end{array}$	$\begin{array}{r}75\\\times4\\\hline300\end{array}$	$\begin{array}{r}43\\\times8\\\hline344\end{array}$	$\begin{array}{r}408\\\times4\\\hline1642\end{array}$	$\begin{array}{r}516\\\times4\\\hline2064\end{array}$

㊴

5.	$\begin{array}{r}21\\4\overline{)84}\end{array}$	$\begin{array}{r}50\\4\overline{)200}\end{array}$	$\begin{array}{r}111\\4\overline{)444}\end{array}$	$\begin{array}{r}72\\4\overline{)288}\end{array}$	$\begin{array}{r}40\\4\overline{)160}\end{array}$	$\begin{array}{r}81\\4\overline{)324}\end{array}$
6.	$\begin{array}{r}10\\4\overline{)40}\end{array}$	$\begin{array}{r}90\\4\overline{)360}\end{array}$	$\begin{array}{r}201\\4\overline{)804}\end{array}$	$\begin{array}{r}120\\4\overline{)480}\end{array}$	$\begin{array}{r}82\\4\overline{)328}\end{array}$	$\begin{array}{r}210\\4\overline{)840}\end{array}$
7.	$\begin{array}{r}22\\4\overline{)88}\end{array}$	$\begin{array}{r}112\\4\overline{)448}\end{array}$	$\begin{array}{r}61\\4\overline{)244}\end{array}$	$\begin{array}{r}31\\4\overline{)124}\end{array}$	$\begin{array}{r}42\\4\overline{)168}\end{array}$	$\begin{array}{r}91\\4\overline{)364}\end{array}$
8.	$\begin{array}{r}11\\4\overline{)44}\end{array}$	$\begin{array}{r}100\\4\overline{)400}\end{array}$	$\begin{array}{r}70\\4\overline{)280}\end{array}$	$\begin{array}{r}92\\4\overline{)368}\end{array}$	$\begin{array}{r}32\\4\overline{)128}\end{array}$	$\begin{array}{r}110\\4\overline{)440}\end{array}$

㊵

9.	$\begin{array}{r}61\\\times5\\\hline305\end{array}$	$\begin{array}{r}19\\\times5\\\hline95\end{array}$	$\begin{array}{r}23\\\times5\\\hline115\end{array}$	$\begin{array}{r}74\\\times5\\\hline370\end{array}$	$\begin{array}{r}109\\\times5\\\hline545\end{array}$	$\begin{array}{r}413\\\times5\\\hline2065\end{array}$
10.	$\begin{array}{r}37\\\times5\\\hline185\end{array}$	$\begin{array}{r}40\\\times5\\\hline200\end{array}$	$\begin{array}{r}86\\\times5\\\hline430\end{array}$	$\begin{array}{r}52\\\times5\\\hline260\end{array}$	$\begin{array}{r}115\\\times5\\\hline575\end{array}$	$\begin{array}{r}205\\\times5\\\hline1025\end{array}$
11.	$\begin{array}{r}28\\\times5\\\hline140\end{array}$	$\begin{array}{r}51\\\times7\\\hline357\end{array}$	$\begin{array}{r}25\\\times9\\\hline225\end{array}$	$\begin{array}{r}50\\\times6\\\hline300\end{array}$	$\begin{array}{r}105\\\times8\\\hline840\end{array}$	$\begin{array}{r}114\\\times5\\\hline570\end{array}$
12.	$\begin{array}{r}87\\\times5\\\hline435\end{array}$	$\begin{array}{r}95\\\times5\\\hline475\end{array}$	$\begin{array}{r}63\\\times5\\\hline315\end{array}$	$\begin{array}{r}24\\\times5\\\hline120\end{array}$	$\begin{array}{r}617\\\times5\\\hline3085\end{array}$	$\begin{array}{r}309\\\times5\\\hline1545\end{array}$

Suggestions to Teachers

NUMBER RELATIONSHIPS

Addition Facts with Sums to 10. To aid the pupil in memorizing the addition facts, repeated use is made of important relationships. One of these relationships, known as the *commutative principle*, is presented on page 12. This principle enables the child to help himself when he forgets the answer to a number fact.

Two other relationships, which simplify the learning of the zero facts in addition and subtraction, are given on pages 84 and 85.

Sums over 10. There are 36 addition facts having sums over 10. To facilitate the learning of these facts through number relationships, they are divided into five groups as follows: 4 doubles (pages 41, 42); 8 near doubles (pages 44, 45); 12 facts containing 9 (pages 62, 63); 8 facts containing 8 (pages 74, 75); and 4 miscellaneous facts (page 82). Grouped thus, these facts are easily learned.

In developing these 36 facts, liberal use must be made of small objects in the classroom. The text presents pictures of small objects to give meaning to the work. After the pupil understands the meaning of each fact, memorizing should begin. In this memorization stage the use of number relationships is effective because they enable the pupil to give the answer to each fact *mentally* without being obliged to count objects again. As soon as the child is able to give promptly and consistently the correct answer to a fact, he no longer needs to use the number relationships. Facts with answers are given on page 311 and 312.

Subtraction and Division Facts. After the pupil understands the meaning of the subtraction or the division facts, he will be greatly aided in remembering the answers by relating the subtraction facts to the corresponding addition facts (pages 43, 48, 49, etc.) and by relating the even division facts to the corresponding multiplication facts (pages 242–245 and 253–255).

PROVISION FOR INDIVIDUAL DIFFERENCES AND REVIEW

Supplementary Exercises. Pages 313–326 give sets of supplementary practice material that can be used in several ways. References to these exercises have been made on certain pages of the text where more practice may be needed. The teacher decides when to assign this material. It may also be used for review.

Use of Chapter 8. Chapter 8 teaches the multiplication and division facts for the 4's and 5's, this work being required in certain schools. Schools teaching only the multiplication and division facts for the 2's and 3's may omit pages 281–299. However, pages 300–310 review and test the year's work and should be used by all schools. Pages 300–310 do not contain work on the 4's and 5's.

Enrichment Work for Superior Pupils. All of Chapter 8, including the 4's and 5's, may be used for superior pupils in schools requiring only the 2's and 3's for all pupils. Pages 296–299 are especially suited to the needs of superior pupils.

Additive Method of Subtraction

This page is for teachers who use the additive method of subtraction. The basic idea of additive subtraction is to find a number to add to the lower number (subtrahend) to make the top number (minuend). Borrowing is not required in this method and for that reason the additive method is often easier for pupils to learn than the take-away method. The pages where subtraction is taught are listed below. In each case the model example is explained by the additive method of subtraction.

Page 37. You can subtract 12 from 25 by adding enough to 12 to make 25. Think, "2 ones + 3 ones = 5 ones." Write 3 in ones place. Think, "1 ten + 1 ten = 2 tens." Write 1 in tens place. The answer is 13. If you add 13 to 12 you get 25, so the answer is right.

$$\begin{array}{r} 25 \\ \underline{12} \\ 13 \end{array}$$

Page 59. Think, "4 ones + 4 ones = 8 ones." Write 4 in ones place. Remember that 1 hundred and 5 tens is the same as 15 tens. Think, "8 tens + 7 tens = 15 tens." Write 7 in tens place. The answer is 74. 74 + 84 = 158, so the answer is right.

$$\begin{array}{r} 158 \\ \underline{84} \\ 74 \end{array}$$

Page 103. Think, "3 ones + 2 ones = 5 ones." Write 2 in ones place. Think, "2 tens + 3 tens = 5 tens." Write 3 in tens place. Think, "4 hundreds + 2 hundreds = 6 hundreds." Write 2 in hundreds place. The answer is 232. 232 + 423 = 655, so the answer is right.

$$\begin{array}{r} 655 \\ \underline{423} \\ 232 \end{array}$$

Page 104. Think, "5 ones + 3 ones = 8 ones." Write 3 in ones place. Think, "4 tens + 0 tens = 4 tens." Do not write 0 because there are no more numbers at the left to subtract. The answer is 3. 3 + 45 = 48, so the answer is right.

$$\begin{array}{r} 48 \\ \underline{45} \\ 3 \end{array}$$

Page 146. 4 ones are more than 2 ones, so you cannot add a number to 4 to make 2. But you can add a number to 4 to make 12. Think, "4 + 8 = 12." Write 8 in ones place. Carry the 1 ten of 12 to tens column and add it to 2 tens, making 3 tens. Think, "3 + 1 = 4." Write 1 in tens place. The answer is 18. You see that 18 added to 24 makes 42, so the answer is right.

$$\begin{array}{r} 42 \\ \underline{24} \\ 18 \end{array}$$

Page 147. Think, "8 + 7 = 15." Write 7 in ones place. Carry the 1 ten of 15 to tens column and add it to 2 tens, making 3 tens. Think, "3 + 1 = 4." Write 1 in tens place. The answer is 17. 17 + 28 = 45, so the answer is right.

$$\begin{array}{r} 45 \\ \underline{28} \\ 17 \end{array}$$

Page 148. Think, "9 + 3 = 12." Write 3 in ones place. Carry 1 ten to tens column and add it to 8 tens, making 9 tens. Remember that 1 hundred and 4 tens is the same as 14 tens. Think, "9 + 5 = 14." Write 5 in tens place. The answer is 53. You see that 53 + 89 = 142, so the answer is right.

$$\begin{array}{r} 142 \\ \underline{89} \\ 53 \end{array}$$

Additive Method of Subtraction

Page 181. Think, "8¢ + 7¢ = 15¢." Write 7 in cents place. Carry 1 dime to dimes column and add it to 4 dimes, making 5 dimes. Think, "5 dimes + 2 dimes = 7 dimes." Write 2 in dimes place. Think, "\$6 + \$3 = \$9." Write 3 in dollars place. The answer is \$3.27. \$3.27 + \$6.48 = \$9.75.

$$\begin{array}{r} \$9.75 \\ \underline{6.48} \\ \$3.27 \end{array}$$

Page 182. Think, "9 + 4 = 13." Write 4 in ones place. Add 1 ten to 4 tens, making 5 tens. Think, "5 + 3 = 8." Write 3 in tens place. Think, "5 + 1 = 6." Write 1 in hundreds place. The answer is 134. 134 + 549 = 683.

$$\begin{array}{r} 683 \\ \underline{549} \\ 134 \end{array}$$

Page 184. Think, "5¢ + 0¢ = 5¢." Write 0 in cents place. Think, "8 dimes + 9 dimes = 17 dimes." Write 9 in dimes place. Add \$1 to \$5, making \$6. Think, "\$6 + \$3 = \$9." Write 3 in dollars place. The answer is \$3.90. You see that \$3.90 + \$5.85 = \$9.75.

$$\begin{array}{r} \$9.75 \\ \underline{5.85} \\ \$3.90 \end{array}$$

Page 185. Think, "5 + 3 = 8." Write 3 in ones place. Think, "9 + 6 = 15." Write 6 in tens place. Add 1 hundred to 3 hundreds, making 4 hundreds. Think, "4 + 0 = 4." Do not write 0 because there are no more numbers to subtract. The answer is 63. You see that 63 + 395 = 458, so the answer is right.

$$\begin{array}{r} 458 \\ \underline{395} \\ 63 \end{array}$$

Page 190. Think, "5 + 5 = 10." Write 5 in ones place. Add 1 ten to 7 tens, making 8 tens. Think, "8 + 6 = 14." Write 6 in tens place. Add 1 hundred to 1 hundred, making 2 hundreds. Think, "2 + 3 = 5." Write 3 in hundreds place. The answer is 365. You see that 365 + 175 = 540, so the answer is right.

$$\begin{array}{r} 540 \\ \underline{175} \\ 365 \end{array}$$

Page 193. Think, "8 + 2 = 10." Write 2 in ones place. Add 1 ten to 2 tens, making 3 tens. Think, "3 + 7 = 10." Write 7 in tens place. Add 1 hundred to 3 hundreds, making 4 hundreds. Think, "4 + 1 = 5." Write 1 in hundreds place. The answer is 172. You see that 172 + 328 = 500, so the answer is right.

$$\begin{array}{r} 500 \\ \underline{328} \\ 172 \end{array}$$

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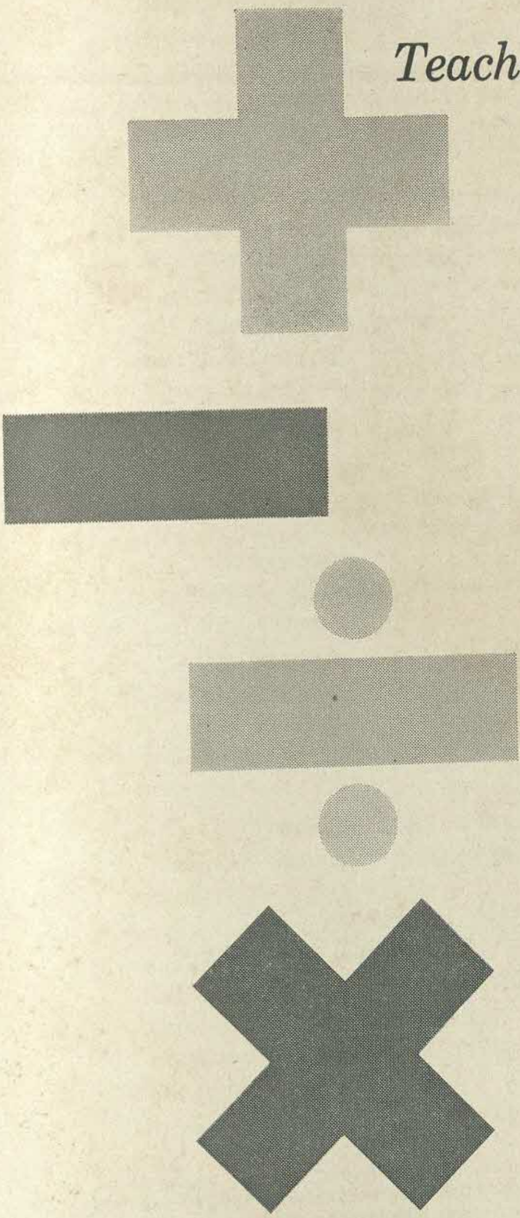

Teacher's Guide and Key for

MOVING AHEAD

American Arithmetic
Second Edition
Grade 3

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EP 10 9 8 7 6 5 4 3 2 1

Use of This Guide. This Guide, together with the Upton-Fuller-McMeen *American Arithmetic, Second Edition, Grade 3, Moving Ahead,* offers the teacher a course in modern methods of teaching arithmetic in Grade 3. The Guide presents the principles of teaching, while the text develops these principles in an organized, sequential program of instruction. This combination provides an effective program of instruction implemented by a comprehensive discussion of instructional methods.

The Guide provides suggestions and helps in teaching the topics on each page of the text as well as specific exercises on the page. To use the Guide successfully, the teacher should study in the text each exercise or development referred to in the Guide.

Since a thorough understanding of the organizational principles of a text assists the teacher in using it effectively, certain outstanding features of the *American Arithmetic* series are stated below.

Philosophy Underlying the Series. The objectives of the *American Arithmetics,* stated briefly, are:

(1) To teach pupils to understand our number system and the meaning of the four fundamental processes with whole numbers, fractions, and decimals

(2) To teach pupils properly to interpret and to solve the problems of everyday life that involve quantitative data

(3) To lead pupils to acquire sufficient skill in computation to enable them to solve problems of everyday life with reasonable speed and accuracy

The attainment of these objectives comes through insight and intelligent understanding rather than through blind obedience to rules and mechanical procedures.

Meaning and Understanding. Meaning and understanding in arithmetic should permeate the entire instructional program. Casual use of objective materials in teaching number facts or explanations of operational processes are not alone sufficient, as important as these are. To achieve greatest gain, meanings and understandings should be consistently stressed over a maximum period of time using a variety of instructional materials and procedures. The constant aim of this series of texts is to teach arithmetic meaningfully so that the pupils will understand and enjoy it. Throughout the series special attention is given to the following features:

1. Basic Concepts and Terms of Arithmetic. The meanings of fundamental concepts relating to whole numbers, fractions, and decimals, as well as the definitions of the technical terms of arithmetic, are explained with unusual clarity.

2. Comprehension of the Fundamental Processes. Clear explanations are given for such basic processes as carrying in addition, regrouping in subtraction, multiplying by a fraction, dividing by a fraction, and dividing by a decimal. It is essential that pupils understand clearly the mathematical rationale of the fundamental processes of arithmetic.

3. Meaningful Processes through Motivating Problems. Each new topic or process is made meaningful through a motivating problem of interest to the pupils. The reason for the process is thus emphasized.

4. Fundamental Principles. Fundamental principles of arithmetic are simply explained and applied throughout the series. These principles, in keeping with modern trends in teaching mathematics, replace arbitrary rules. The series subscribes to the belief that it is more important for pupils to understand and be able to apply fundamental principles than to be able to name them mathematically. For this reason, pupils are taught very early that the order of adding two numbers does not affect their sum. Thus, for example, $3 + 5 = 5 + 3$. In modern mathematics this is referred to as the *commutative principle of addition.*

5. Meaningful Problems. All problems and projects relate to the interests and experiences of children and are written in language they can understand.

6. Our Number System. The principles underlying our number system are emphasized in each book of the series.

Number Relationships. The fundamental number facts for the four operations are *foundation stones* of the arithmetic program. The number facts of addition and subtraction are introduced in Grades 1 and 2, and those for multiplication and division in Grades 3 and 4. It is common in many schools, however, to find pupils in Grades 5 through 8 who are not sure that $8 + 9 = 17$ or that $7 \times 9 = 63$. Defects of this kind are a serious hindrance to present and subsequent work in arithmetic.

The reason for uncertainty of number facts on the part of pupils may often be traced to the arbitrary *drill and memorize* technique by which they were taught. Generally such technique consists of some preliminary use of objective materials to emphasize the answers, followed by drill and memorization. The shortcoming of this approach is that pupils are not led to see the number relationships and to learn to *think* about number facts mentally. When the pupil forgets the answer to a number fact taught in this manner, he has no alternative for finding the answer but to consult his book, count objects or his fingers, or ask someone what the answer is. *American Arithmetics* attempt in every way possible to avoid such inefficiency on the part of the pupil. After preliminary work with objective materials, pupils are taught to "think" answers mentally by perceiving *number relationships.* This procedure makes it unnecessary for a pupil to depend upon counting or upon the teacher for finding the right answer. The learning of number facts through *perception of number relationships* is *the most effective method* yet devised. An important consequence of this approach, beyond mastery of the number facts themselves, is that a proper foundation is laid for other mental calculations. Pupils all too often in the past have learned to rely almost exclusively upon paper and pencil for performing operations. *American Arithmetics* stress mental as well as written arithmetic.

Here is an illustration of how new addition facts may be related to those already learned. It is generally recognized that pupils learn the doubles, such as $5 + 5$, $7 + 7$, and $8 + 8$, more readily than the non-doubles. Having learned the doubles, it is an easy matter for the pupil to relate other addition facts that are nearly the same. For example, if the pupils know that $5 + 5 = 10$, they can easily perceive that $5 + 6 = 11$. In modern mathematics this would be shown to be an application of the *associative principle of addition* and would be illustrated in this case as $5 + (5 + 1) = (5 + 5) + 1$. This principle means that addends may be associated differently and their sum will remain the same. This and other principles, however, are presented intuitively in the texts through a variety of meaningful procedures so that pupils will not be burdened with unnecessary terminology at their level of development. Through procedures of this kind, otherwise difficult number combinations are easily learned by associating them with the doubles.

Another basic approach employed in presenting number facts meaningfully is to relate those number facts that belong to the same number family. For example, starting with a *set* of 5 things, it is easy for the pupil to discover that $1 + 4 = 5$, $2 + 3 = 5$, $3 + 2 = 5$, and $4 + 1 = 5$. Similarly it is easy for the pupil to see how subtraction facts are related to these addition facts as follows: $5 - 1 = 4$, $5 - 2 = 3$, $5 - 3 = 2$, and $5 - 4 = 1$. When the facts are learned in this fashion, it becomes easy for the pupil to perceive how to regroup numbers whose sum is unknown into combinations that are known. Thus if $9 + 7$ is unknown, it may be regrouped mentally in many ways, such as: $9 + 7 = (8 + 1) + 7 = 8 + (1 + 7) = 8 + 8 = 16$, or $9 + (1 + 6) = (9 + 1) + 6 = 10 + 6 = 16$. Addition and subtraction facts and processes are closely related at all levels. This is in keeping with modern mathematics which stresses that addition and subtraction are *inverse operations* and should consequently be closely related.

Problem Solving and Projects. Since success in problem solving is dependent upon good thinking, pupils should be encouraged to analyze the meaning of a problem and to make intelligent decisions about how to solve it. The *American Arithmetics* teach the pupil to relate number stories that are stated differently but which involve similar thought patterns. All the problems in the texts are related to the experiences and interests of children. The problems are carefully graded and are limited to one-step problems through Grade 3. A number of special features in problem solving are incorporated in the Grade 3 text, including a series of problem tests, one such test appearing at the end of each chapter.

Many challenging projects relating to children's activities both in and out of school are also provided in the texts. Frequent footnotes in the Teacher's Edition call attention to such activities.

Vocabulary. The vocabulary in each of the texts has been selected with unusual care. Reading difficulties have been minimized by keeping the general and technical vocabulary below the reading level in basic readers.

In *American Arithmetic, Grade 3,* for example, the general and technical vocabulary is limited to approximately 800 words. Reading difficulties have been reduced to a minimum so far as *American Arithmetic, Grade 3* is concerned.

Maintenance Program. Full provision has been made to maintain skills in computation and problem solving as follows:

1. **Reteaching of Important Topics.** Each book in this series devotes the first one or two chapters to a review and a reteaching of the important topics in the preceding year's work.

2. **Diagnostic Tests.** Diagnostic tests with keyed references to remedial exercises are given at the end of each chapter. See pages 92, 120, 158, 198, and so on of *American Arithmetic, Grade 3.*

3. **Problem Tests.** A problem test, designed to test the pupil's ability in problem solving, is given in each chapter. See pages 40, 91, 119, 157, 197, and so on.

4. **Chapter Reviews.** Reviews covering the new work of each chapter are provided. See pages 39, 90, 118, 156, 196, 238, and 278.

5. **Oral and Written Reviews.** Reviews covering important topics previously taught are frequently given. See pages 73, 101, 155, 208, 236, and so on.

6. **Mixed Practice.** Computational practice on the four fundamental processes is amply provided for. See pages 117, 187, 218, 236, and 306.

7. **Maintenance of Arithmetic Vocabulary.** Reviews which give an opportunity to check understanding of words essential to arithmetic are provided. See pages 115, 151, 183, and 276.

Use of the Textbook. Before starting the year's work, read "Suggestions to Teachers" on pages 327–329 of *American Arithmetic, Grade 3.* These suggestions contain valuable teaching hints and give various helps for teaching specific pages of the text. In teaching *American Arithmetic, Grade 3,* follow the textbook, page by page. Do not skip around in the book, teaching the topics in a different order from that in which they are presented. Arithmetic is a *sequential subject,* which means that each topic must be taught in its proper order because of the close interdependence of the various topics. For example, single carrying in addition must precede double and triple carrying, multiplying a number by a 1-figure number must come before multiplying by a 2-figure number, the multiplication of fractions must be taught before the division of fractions. Teaching the successive topics in arithmetic is much like forging the links of a chain. If one of the links is defective, the chain breaks. If a child is absent from school when a certain topic is taught, he may be much handicapped on his return since the topic he missed may be essential to his understanding of the new work. Hence special attention should be given to absentees upon their return to school.

This emphasis on the importance of presenting the topics in their sequential order applies with particular force to arithmetic. Other school subjects, such as history, English, and geography, are not as highly sequential in nature as arithmetic. In geography, for example, a pupil who is absent from school when a study of the New England States is made is not handicapped later in his study of the North Central States. On the other hand, his absence may seriously affect his progress in arithmetic.

The fact that arithmetic is a sequential subject makes it very important for you to try to learn *at frequent intervals* the difficulties each pupil encounters, rather than to let these difficulties accumulate. By the aid of the diagnostic tests and other tests given in the text, find out each pupil's difficulties as the work progresses; then take the necessary steps to correct them. If the pupil's difficulties with arithmetic are permitted to accumulate, he will become more uncertain of his arithmetic skills in each successive grade.

Key. All answers are given on the appropriate pages in the Guide. Those teachers not having the annotated edition of the text may find it desirable to transfer the answers directly to the textbook pages for ready reference.

Chapter 1

Review at the Beginning of Grade 3. Most of the pupils in Grades 1 and 2 have had many experiences with numbers, and most courses of study make provision for the teaching of the easy addition and subtraction facts in these grades. The authors feel, however, that Chapter 1 of the third-grade text should provide a reteaching program for these basic skills and understandings. Naturally, an inventory at the beginning of the third grade is advisable. Should you determine that most of the pupils have an adequate mastery of the work in these initial chapters, plan to use this chapter more as a review than as a complete reteaching program. Conversely, should you discover that some pupils lack many of the skills retaught in Chapter 1, the use of the workbook *I Can Add* (*Arithmetic Workshop, Book 2*) is recommended. Third-grade pupils will do rather quickly the exercises found in this workbook, and the time spent will easily be made up by the rapid progress they will make when they start the regular work in *American Arithmetic, Grade 3.*

Aims of Chapter 1. The major aims of Chapter 1 are to reteach the basic understandings and fundamental skills acquired in *American Arithmetic, Learning about Numbers.* Stated specifically, these aims are to:

1. Reteach rational and rote counting of numbers 1–100.
2. Develop number meanings, sequential nature, place value, and the tens nature of these numbers.
3. Reteach ordinals — first through tenth.
4. Review basic addition and subtraction facts with sums and minuends of 10 or less.
5. Reteach one-column addition limited to 3 addends and sums not greater than 10.
6. Teach adding and subtracting 2-figure numbers using basic facts listed above.
7. Reteach value and equivalents of cent, nickel, and dime.
8. Review simple one-step problems using addition and subtraction thought patterns.
9. Review specialized arithmetic vocabulary.

Page 1

Aim: To provide experiences in rational and rote counting

Suggestions: Children who hesitate in the simple counting exercises on page 1 should be encouraged to count things in the classroom. When they miscount or hesitate, another pupil should be permitted to offer assistance. Daily exercises should be provided such pupils by letting them take attendance, count and report on the number of milk bottles needed or the number of pupils taking a hot lunch, and make countless other meaningful reports. This constant practice, in which the slow learner can assist you, gives status to the pupil and importance to the counting activity. The significance of ex. 10 cannot be overlooked. This activity sets the stage for abstract counting and opens the door to work in number sequences to follow.

Key: **1.** 9 children. **2.** 4 girls; 5 boys. **3.** 6 children. **4.** 3 children. **5.** 1 girl; 2 boys. **10.** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Page 2

Aim: To show the relationship between the number quantity, the number name, and the numeral

Suggestions: It is sometimes easy to forget that children find the recognition of a number name quite difficult. Although most of these difficulties disappear in the early part of the first grade, it is certainly reasonable to conclude that a child who does not recognize a numeral such as 6 cannot talk intelligently about the sum of 3 and 3.

The distinction between *number* and *numeral* as emphasized in some contemporary arithmetic programs is worthy of note at this point. From the standpoint of the mathematician, number is an abstraction that can be neither seen nor written directly. For example, there are many different sets which have the property of "twoness," such as eyes, ears, hands, parents, and so on. Yet none of these sets is the number 2. The symbol we write to name the number we are thinking about is called the *numeral* for the number. Just as there are many pictures of Grand Canyon we can hang on the wall to represent the real Grand Canyon, similarly there are many numerals that can be written to represent the same number. Thus 15, $10 + 5$, $20 - 5$, XV, and so on are but different numerals that name or represent the same number. It will be observed that the numeral 15 is composed of two digits, 1 and 5, and yet 15 is thought of as a single numeral. *American Arithmetics* do not emphasize this distinction between number and numeral in the pupil texts. The authors feel that the distinction is not of sufficient importance to warrant special consideration. On the other hand, if the teacher wishes to emphasize this distinction, she should feel free to do so.

It would be a good idea to supplement the work on this page by displaying groups of from 1 to 10 objects for pupils to identify. This can be done in a variety of ways ranging from real objects to cards with arrangements of geometric symbols upon them. A flannel board or magnetic board is very useful for this purpose. Recognition of groups at a glance helps to dispense with the need of counting groups by ones and at the same time provides readiness for addition.

Page 3

Aim: To talk about the coins: cent, nickel, dime

Suggestions: Most children will need little instruction in this vital part of their out-of-school life, and every child will gladly talk about what a cent, nickel, and dime will buy. Care should be exercised to develop the vocabulary words *coin* and *cent,* which may not be commonly used by all children at this grade level.

(*Money* is more frequently used.) All the pupils will enjoy telling what they think these coins will buy and what could be purchased if some of the coins were at their immediate disposal. Teachers can encourage thoughtful participation in a factual discussion of "What a Nickel Will Buy" or "What a Dime Will Buy." In fact, many classes enjoy making a class poster on some such subject, each child bringing to class a picture to be pasted on the poster. Only actual representations should be posted. For instance, if an ice cream cone cannot be purchased for a dime, then a picture of an ice cream cone cannot be placed on the poster "What a Dime Will Buy." An activity such as this lays the groundwork for further instruction in consumer education and encourages children to be realistic rather than wishful in their thinking concerning their expenditures.

Workbook Reference: Upton-Uhlinger: Arithmetic Workshop: Book 3, page 4 (published by American Book Company)

Page 4

Aims: To extend experiences with coins to include combining coins and their values; to review some arithmetic terms taught in Grades 1 and 2

Suggestions: Many classrooms will have a box of play coins at each pupil's desk. These coins are similar in shape and design to real ones. You might have a wall pocket chart and a set of large display coins for use in relating stories dealing with recent monetary experiences. The speaker will illustrate his story at the wall pocket chart while each child follows by counting out the coins on his desk.

Review these arithmetic terms found in ex. 5–10:

comes after
more than
smallest
comes before
next

Key: **1.** 1 nickel, 2 pennies; 1 dime; 1 nickel, 1 penny; 1 nickel. **2.** 1 nickel, 2 pennies; 1 nickel; 1 nickel, 4 pennies; 3 pennies; 4 pennies; 1 dime.

Page 5

Aim: To prepare for the addition stories appearing on page 6

Suggestions: The real purpose of this readiness work is to make certain that pupils understand the words they will meet frequently on the pages to follow. *Most* and *together* are words which pupils can pronounce without understanding their meanings. Additional practice can be provided through raising such questions as:

1. Are there more boys than girls in the room?
2. Which row has the most pupils in it?
3. Which reading group is the largest?
4. Are there more girls than boys on the playground?

Key: **1.** Tom, 6¢; Ann, 4¢; Jim, 5¢; Betty, 3¢; Mary, 2¢; Bob, 7¢. **2.** Tom. **3.** Betty. **4.** Jim. **5.** Bob's group. **6.** Yes. **7.** No. **8.** Ann. **9.** Yes. **10.** No. **11.** No. **12.** 10 pennies.

Pages 6–7

Aim: To redevelop the concept of addition by means of number stories

Suggestions: Since it is not possible to do full justice to the concept of addition on the printed page, have the pupils illustrate with real objects how two groups are combined or joined together. Then have the children interpret how the first picture on page 6 shows two kittens in the act of joining three other kittens; and how the second picture shows how many there are in all after the two groups are combined. Starting with ex. 2 on page 7, point out that to save space on the printed page the pictures show two groups that have already been put together. Different colors or markings are used to distinguish the groups that are put together.

Although this work is not labeled as addition, children should quickly recognize the basic addition facts in these problem situations. The teacher may wish to supplement the development on these pages by writing the number facts in horizontal and vertical forms as follows.

2 kittens and 3 kittens are 5 kittens
3 kittens and 2 kittens are 5 kittens
$2 + 3 = 5$ $3 + 2 = 5$

$$\begin{array}{r} 2\text{ kittens} \\ +\,3\text{ kittens} \\ \hline 5\text{ kittens} \end{array} \qquad \begin{array}{r} 3\text{ kittens} \\ +\,2\text{ kittens} \\ \hline 5\text{ kittens} \end{array}$$

Stress that it is easy to *discover* the sum of two numbers. Confidence in one's ability to find an answer without asking the teacher or a friend is the key to happy and successful mastery of arithmetic. Nothing is more frustrating to the learner than to have to guess at an answer. Here the groundwork is laid for the discovery method. Any answer not known can be discovered by a very simple and valid method; namely, counting out the answer. Although this counting out will be replaced at a later date by the authors' development of relationships among number facts, the counting procedure for discovering an answer is acceptable at this stage.

Caution the pupils never to write in their textbooks.

Key: Page 6 **1.** 3 kittens + 2 kittens = 5 kittens; 5 kittens; 5 kittens. **2.** 3 birds + 4 birds = 7 birds; 7 birds; 7 birds.
Page 7 **1.** 2; 2; 4. **2.** 3; 3; 6. **3.** 4; 4; 8. **4.** 5; 5; 10.

Page 8

Aim: To review in horizontal form the addition facts having sums of 6 or less

Suggestions: Have pupils demonstrate the addition facts using representative materials or by drawing dots, circles, triangles, and so on. Lead them to see that the order of adding two numbers makes no difference in their sum. In modern mathematics this principle is referred to as *the commutative principle of addition*. At this level it is not necessary to name this principle which you may have referred to in the past as "the principle of reverses." Point out, for example, that since $3 + 1 = 4$ and $1 + 3 = 4$, then $3 + 1 = 1 + 3$ because both have the same sum.

Key: **1.** 2. **2.** 3. **3.** 3. **4.** 4. **5.** 4. **6.** 4. **7.** 5. **8.** 5. **9.** 5. **10.** 5. **11.** 6. **12.** 6. **13.** 6. **14.** 6. **15.** 6.

Page 9

Aim: To teach the words *add, sum, addition, addition fact*

Suggestions: Words are difficult to master, especially when they deal with abstract ideas. Words like *sum* and *addition* do not represent things with which children are familiar. Some of the slower pupils will need much practice and teacher patience before they master these words. A continued use of such terms during the next few weeks will greatly assist in the final mastery of this lesson.

Exercises 3–6 should be assigned for written practice. It would be a good idea to have the children write the facts first in vertical form and then in horizontal form. Observe the work habits of children. The child who hesitates on certain answers, who audibly counts out the answer, who erases frequently is evidencing a lack of mastery of these basic facts. You should correct each paper carefully and list individual errors, thus laying the groundwork for individualized reteaching programs. Construct drill cards, and enlist the services of more advanced members of the class in helping the slower pupil. Notice the test on page 16 and remember that during the interim many children will correct their individual mistakes and thus secure a much better record on the test. *Now* is the time to help the pupils develop the security they need in arithmetical activities. Children who are allowed to go into Chapter 2 without a firm knowledge of this work may develop a permanent dislike for arithmetic.

Workbook Reference: Arithmetic Workshop, Book 3, page 5

Key: **1.** 4 pennies; 2 pennies; 6 pennies; 6 pennies. **3.** 5; 5; 2; 5; 5; 3; 3; 4; 6. **4.** 6; 6; 4; 6; 6; 5; 6; 5; 6. **5.** 6; 4; 6. **6.** 5; 6; 4.

Pages 10–11

Aim: To redevelop the take away concept of subtraction by means of number stories

Suggestions: As in the case of addition it is difficult to convey properly the concept of subtraction by means of pictures alone. Accordingly, supplement the presentation on these pages by having children demonstrate with objects the meaning of "take away" subtraction. Relate the subtraction facts to the addition facts studied previously. Point out that whereas we join one group with another group in addition, in subtraction we take away one group from the total group and find out how many are in the group that remains. For instance, since 4 and 2 are 6, then 6 take away 2 leaves 4. Point out that to save space in the text, starting with ex. 2 on page 11, the things in the group taken away are simply crossed out with large x's. Similarly, this procedure can be used by the pupils in illustrating subtraction stories on paper.

Workbook Reference: Arithmetic Workshop, Book 3, page 9.

Key: Page 10 **1.** 3 kittens − 1 kitten = 2 kittens. **2.** 4 dolls − 1 doll = 3 dolls. **3.** 6 books − 3 books = 3 books. **4.** 6 pencils − 5 pencils = 1 pencil. **5.** 5 dots − 3 dots = 2 dots. **6.** 5 pennies − 2 pennies = 3 pennies.

Page 11 **1.** 6 birds − 3 birds = 3 birds; 3. **2.** 5 apples − 2 apples = 3 apples; 3. **3.** 5 kittens − 3 kittens = 2 kittens. **4.** 6 pencils − 2 pencils = 4 pencils; 4 pencils. **5.** 10 pennies − 3 pennies = 7 pennies.

Page 12

Aim: To emphasize the vocabulary associated with take away subtraction

Suggestions: Redevelop the idea that the subtraction answer tells how many are *left* when a group is taken away. Emphasize the meaning of the words *subtracting, minus, take away, subtract, subtraction example,* and *subtraction fact.* Notice that beginning with ex. 3 the phrasing changes from "take away" to "from." This is a change in direction which causes trouble among some children. When the question reads "6 take away 2," the thought pattern proceeds from the larger number to the smaller number. When the question reads "2 from 6," the pattern starts with the smaller number and proceeds to the larger. Confusion in understanding at this level will lead to further confusion when regrouping of the minuend is introduced in subtraction. *Pause here long enough to be certain* that children understand that "take away" and "from" are merely different ways of saying "subtract" and that in either case the smaller number is taken away from the larger number.

In ex. 4–6 stress that each problem may be stated with numbers only. Encourage the children to write number sentences for the problems. For example, in ex. 4 the number sentence $9 - 2 = \square$ shows the meaning of the problem. As soon as the answer is substituted for the box (called a *number frame*), the sentence becomes the familiar number fact, $9 - 2 = 7$. In modern mathematics the former is referred to as an *open* sentence and the latter as a *closed* sentence. Open sentences are neither true nor false, but closed sentences are true or false depending whether the correct number is substituted for the frame. Direct attention to the way the examples appear in vertical form on the right of each problem and have the pupils supply the answers.

Workbook Reference: Arithmetic Workshop, Book 3, page 9

Key: **1.** 6 apples − 2 apples = 4 apples; 4. **4.** 9 pennies − 2 pennies = 7 pennies. **5.** 9 pennies − 5 pennies = 4 pennies. **6.** 9 pennies − 7 pennies = 2 pennies; $9 - 7 = 2$.

Page 13

Aim: To teach relationships among the subtraction facts

Suggestions: Have the children demonstrate with groups of objects how to take away various numbers of objects in sequence. Follow with the development on the page. See that the children understand how to cover the group subtracted with their hand or a piece of paper. Encourage the children to relate the subtraction facts to other number facts they know by making such statements as: "Since $6 - 1 = 5$, then $6 - 2 = 4$;" and "Since $2 + 3 = 5$, then $5 - 2 = 3$." Learning how to relate number facts, starting with the simpler ones first, is most important in facilitating the learning of the more difficult facts and paving the way toward mental arithmetic.

Key: **1.** 1. **2.** 2; 1. **3.** 3; 2; 1. **4.** 4; 1; 3; 2. **5.** 5; 1; 4; 2; 3.

Page 14

Aim: To relate number facts belonging to the same number family

Suggestions: Before assigning the exercises for individual work, give instructions, such as: "Put 6 counters on your desk. Now add 1 more counter to the group of 6. How many counters are there now? What addition fact tells this story? What other addition fact also tells the same story? Now take away 1 counter from the group of 7. How many are left? Put the counter back and take away 6 from 7. How many are left? Write the subtraction facts that tell these stories." You may wish to refer to these facts as the family of facts for 1, 6, and 7. Encourage the pupils to state relationships among the number facts, such as, "Since $3 + 4 = 7$, then $7 - 3 = 4$ and $7 - 4 = 3$."

Key: **1.** 7; 7; 6; 1. **2.** 7; 7; 5; 2. **3.** 7; 7; 4; 3. **4.** 8; 8; 6; 2. **5.** 8; 8; 5; 3. **6.** 8; 4. **7.** 8; 8; 7; 1.

Page 15

Aim: To help pupils see that reversing the order of two addends makes no difference in their sum

Suggestions: See the suggestions for teaching page 8, which explain the principle involved. By this time the pupils have experienced many situations from which they should generalize that even though the order of numbers is reversed, the sum is always the same. You may wish to strengthen this generalization by writing algebraically that $a + b = b + a$, where a and b stand for any two numbers. If number frames are used in place of letters, then $\square + \triangle = \triangle + \square$. In the case of rapid learners, you may wish to point out that not all operations are *commutative;* for example, in subtraction $5 - 2$ does not equal $2 - 5$ nor does $6 \div 2$ equal $2 \div 6$ in division. Only multiplication is commutative as is addition.

Workbook Reference: Arithmetic Workshop, Book 3, page 16

Key: **1.** 5 apples; 5 apples. **3.** $4 + 3 = 7$; $3 + 4 = 7$; $3 + 5 = 8$; $5 + 3 = 8$. **4.** Since $2 + 5$ and $5 + 2$ both name the same number, they are equal to each other. **5.** $3 + 4 = 4 + 3 = 7$; $4 + 2 = 2 + 4 = 6$; $1 + 7 = 7 + 1 = 8$; $2 + 3 = 3 + 2 = 5$. **6.** $2 + 5 = 5 + 2 = 7$; $5 + 3 = 3 + 5 = 8$; $2 + 6 = 6 + 2 = 8$; $6 + 1 = 1 + 6 = 7$.

Page 16

Aims: To test mastery of the addition facts with sums through 8; to develop oral facility in solving and stating number stories using the number facts

Suggestions: Children who are hesitant in giving the sums to the addition facts should be given additional help at this point. Have these pupils work with partners using flash cards to speed up their responses. If commercially prepared flash cards are not available, have the pupils make their own and use them regularly. Assist the pupils to read and solve the problems in ex. 6–9. Ex. 10 directs them to make up number stories of their own to illustrate number facts. Some of the slow readers may excel in this activity which may be profitably correlated with the story hour. Continually urge pupils to use numbers in telling stories.

Key: **1.** 2, 3, 3, 4, 4, 4, 5, 5, 6. **2.** 6, 5, 5, 6, 6, 7, 8, 6, 7. **3.** 6, 7, 7, 7, 7, 8, 8, 7, 8. **4.** 8, 7, 8, 7, 8, 7, 8, 6, 8. **5.** 6, 7, 8, 8, 5, 8, 6, 8, 8. **6.** 7. **7.** 7. **8.** 6. **9.** 5.

Page 17

Aims: To test mastery of the subtraction facts with minuends through 8; to provide practice in solving subtraction stories

Suggestion: Follow the same procedures as suggested for page 16.

Key: **1.** 1, 2, 1, 3, 1, 2, 4, 1. **2.** 3, 2, 5, 1, 4, 3, 2, 6. **3.** 1, 5, 4, 2, 3, 7, 6, 1. **4.** 2, 3, 5, 4, 2, 2, 2, 3. **5.** 4, 3, 4. **6.** 3, 5, 6. **7.** 4. **8.** 3. **9.** 2. **10.** 5.

Pages 18–19

Aims: To reteach addition and subtraction facts having sums and minuends of 9 and 10; to establish relationships among these facts

Suggestions: Follow procedures similar to those suggested for page 14 in helping pupils discover the relationships among the number facts in a given family. Point out that not only is there a number family for each of the four facts in ex. 1–4 on either page, but there is also a larger family consisting of all the facts having sums or minuends of 9 on page 18; and similarly a larger family for 10 on page 19. Help pupils discover the relationships that exist on either page among the various number facts. For example, it is easy to establish the sum of $7 + 2$ if it is known that $8 + 1 = 9$. All that is necessary is to take 1 from the group of 2 and put it with the 7, making $8 + 1$. This may be written in the form of a number sentence as $7 + 2 = 7 + (1 + 1) = (7 + 1) + 1 = 8 + 1 = 9$. The parentheses are used informally as grouping symbols. Pupils should easily see that the way addends are grouped together has no effect upon their sum. In modern mathematics this principle is called *the associative principle of addition.* Stated algebraically with letters to stand for any numbers whatever, it becomes $a + (b + c) = (a + b) + c$. With number frames instead of letters, it would appear as $\square + (\triangle + \triangledown) = (\square + \triangle) + \triangledown$. This principle permits freedom in the way addends may be grouped or associated together, and consequently is of great importance in mental addition of all types. For example, there is little need to find the sum of $998 + 684$ in the customary manner on paper if the *associative principle of addition* is employed mentally as $998 + 684 = 998 + (2 + 682) = (998 + 2) + 682 = 1000 + 682 = 1682$.

Key: Page 18 **1.** 9, 9, 6, 3. **2.** 9, 9, 5, 4. **3.** 9, 9, 8, 1. **4.** 9, 9, 7, 2. **5.** 9, 9, 9, 9, 9, 9, 9, 9. **6.** 8, 1, 2, 7, 6, 3, 4, 5. **7.** 8, 4, 9, 2, 9, 6, 9, 5.

Page 19 **1.** 10, 10, 9, 1. **2.** 10, 10, 8, 2. **3.** 10, 10, 7, 3. **4.** 10, 10, 6, 4. **5.** 10, 5. **6.** 9, 10, 9, 10, 5, 6, 2, 3.

Page 20

Aim: To help pupils discover relationships among the addition facts

Suggestions: Continue as before, helping pupils discover how to "think" the sum of an addition fact they do not know by relating it to a known addition fact that is about the same. Have the pupils explain orally how to relate the pairs of facts presented on this page.

Key: **1.** 6, 7. **2.** 8, 9. **3.** 9, 10. **4.** 4, 5; 8, 9; 9, 10; 9, 10. **5.** 9. **6.** 8.

Page 21

Aim: To reteach the ordinals — *first* through *tenth*

Suggestions: Many pupils will already be familiar with the ordinals. Uses for *first, second, third,* and so on are found in almost every classroom activity: the *first* thing today, the *third* pupil, the *tenth* example. The game "I am thinking of . . ." is enjoyed by pupils. You start by saying: "I am thinking of a girl in the third row." The pupils guess, and the best guesser becomes the leader and continues with the game. Of course, *rows* can be changed to *seats*, and so on.

Key: **1.** Jack. **2.** Alice. **3.** Jim. **4.** Bill. **5.** First. **6.** Eighth. **7.** Jim.

Page 22

Aims: To teach pupils to see beauty in number patterns and hence lend interest to needed review; to prepare pupils for the more involved patterns on page 25

Suggestions: Point out how the numbers are to be added in the direction of the arrows. It might be a good idea to mimeograph the page so the fun of completing the number patterns will not be marred by the effort of drawing the patterns. You may wish to follow with page 25 immediately so as to give added purpose to page 22.

Key: **1.** 7, 9. **2.** 8, 8. **3.** 7, 6, 9, 10, 10. **4.** 8, 9, 10, 10, 10. **5.** 6, 8, 10, 10. **6.** 8, 10, 10, 9.

Page 23

Aim: To reteach the concept of zero and its numeral "0" as related to a group that has no elements

Suggestions: Down through the ages the concepts of zero have been difficult for people to comprehend. This may have been due to poor teaching in many cases. As early as possible, pupils should be led to see these different uses of zero: (a) as a symbol to describe an empty set or group; (b) as a place holder; and (c) as a number accorded a place on a number scale along with the rest of the numbers. In (c) zero is used as a reference mark on a number scale such as a thermometer. In (b) one of the purposes of 0 in a number such as 30 is to hold the 3 in tens' place. Of course, in 30 the 0 also states there are no ones in ones' place. It is unwise to overstate the case for zero as a place holder since every other digit is also a place holder when writing numerals. For example, in 35 the 5 not only states that there are 5 ones in ones' place but it holds the 3 in tens' place.

The purpose of this page is to casually present the first usage of zero as a description of an empty group. Actually this is a fairly difficult usage to fully appreciate. In the case of addition, for example, one does not ask a clerk for 5¢ worth of candy and 0¢ worth of gum. However, in keeping scores in games there is often a need to add zero to a number, as in the case of a baseball inning where one team scored 3 runs and the other team scored none. In a situation like this pupils can easily be led to see that $3 + 0 = 3$. In the case of subtraction, it makes relatively little sense to a child to talk about going to a store with 5¢ and spending 0¢, and point out that 5¢ − 0¢ = 5¢. The child is not likely to visualize subtraction in this situation. However, there is a very real purpose to subtracting a number from itself, resulting in the need for a symbol to indicate that there is no remainder. Children have frequently experienced a situation of this type; for example, when they went to the store with a nickel, spent the nickel, and found that they had no money remaining.

Supplement the development in ex. 1–5 by presenting similar situations involving the use of zero. Correlate the lesson with activities during the game period in which zero scores are likely to result. Let the pupils tell orally which side won by adding the scores they have earned.

Key: **1.** 4. **2.** 2. **3.** None, not any, or zero. **6.** 10¢. **7.** 4¢. **8.** 10¢. **9.** 8, 7, 2, 8, 9, 1, 9, 6.

Page 24

Aim: To reteach single-column addition with 3 addends

Suggestions: The real teaching situation here is in securing pupil understanding of the nature of the *unseen number*. For instance, in the first problem in dealing with Peter and his money, the *unseen number* is 3. Care should be taken to determine whether all the children fully understand this new process step. Ample practice is provided in ex. 3–5, and the observing teacher will be checking on the work habits of each pupil as this work unfolds.

Some teachers will reasonably ask, "Why teach children to add up rather than down?" Everyone realizes that there is no basic difference between the two methods of adding. However, in the initial stages of learning addition, it is best to suggest a method lest the pupils skip around and omit an addend. Research shows that most accountants and business people adopt the procedure of adding up and checking by adding down. Thus, the authors follow this established business procedure. However, teachers who have been schooled in the downward method of addition should not feel that such method is inferior. Actually, there is no difference.

Workbook Reference: Arithmetic Workshop, Book 3, page 14

Key: **2.** 5 books + 2 books + 3 books = 10 books. **3.** 10, 8, 10, 10, 8, 8, 9, 10. **4.** 9, 9, 10, 9, 10, 9, 10, 9. **5.** 10, 9, 10, 10, 8, 7, 9, 8.

Page 25

Aim: To provide necessary practice in addition through the completion of interesting number patterns; practice in addition need not consist of uninteresting drill of the conventional type alone

Suggestions: Help the pupils read and interpret the instructions. Be sure that they add the numbers in all possible directions. Completion of the patterns should reinforce the idea that the order of adding two numbers makes no difference in their sum (*the commutative principle of addition*).

Key: **2.**

3	4	7	8
6			6
5			5
8	4	7	3

3.

10	8	7	5
9			9
6			6
5	8	7	10

4.

9	8	5	4
10			10
3			3
4	8	5	9

5.

7	9	8	10
9			9
8			8
10	9	8	7

Page 26

Aim: To teach pupils how to find the answer to an unknown subtraction fact by relating it to an addition fact or another subtraction fact that is about the same

Suggestions: Have the pupils complete ex. 1–5 orally; and next have them explain how to relate similarly other subtraction facts with corresponding addition facts. Then have them explain the thought processes in ex. 6–9. Other difficult subtraction facts may be related to known subtraction facts in the same way. Do not attempt to write number sentences with parentheses to illustrate subtraction in the same way that you may have illustrated addition, since the associative principle does not apply to subtraction. For example, it would be easy to make the mistake of writing the following sentence as an illustration of ex. 7: $10 - 3 = 10 - (2 + 1) = (10 - 2) + 1$. The latter part of this sentence is in error since it would be necessary to subtract the 1 instead of adding it. Later in algebra it can be shown why the 1 should be subtracted, but this would be difficult to do at this point.

Key: **1.** 3. **2.** 6. **3.** 5. **4.** 2. **5.** 5. **7.** 7. **8.** 3. **9.** 6, 5; 2, 1; 2, 7; 5, 5.

Page 27

Aim: To retest mastery of the basic subtraction facts with minuends of 10 or less

Suggestion: Follow the plan explained for page 16.

Key: **1.** 1, 4, 4, 2, 4, 3, 8. **2.** 2, 1, 3, 3, 2, 5, 7. **3.** 1, 4, 2, 3, 1, 4, 2. **4.** 5, 1, 2, 3, 5, 9, 6. **5.** 4, 5, 2, 2, 5, 1, 5. **6.** 7, 3, 1, 7, 6, 7, 4. **7.** 1, 1, 6, 6, 8, 3, 3. **8.** 1 candy. **9.** 4 airplanes. **10.** 4 eggs.

Page 28

Aims: To reteach number names from 11–20; to stress the meaning of the suffix *teen*

Suggestions: Numbers beyond 9 reveal the tens nature of our number system. This page reteaches the concept and provides in ex. 1–5 activities in which a number is expressed as "ten and." Much supplementary work may be needed at this point. Number cards picturing numbers from 10–100 will prove most helpful. Play money (dimes and pennies), bundles of thin sticks, and tens number flash cards may also be used. When ex. 6 is reached, the more alert pupil will undoubtedly ask why numbers which express ten and one and ten and two are not called "oneteen" and "twoteen"? This is an excellent question about our number system. For the information of the teacher, *eleven* and *twelve* are number names which we have inherited from an earlier number system, which was a twelve-base system used by the Anglo-Saxon tribes. The 12 inches to a foot, 12 things to a dozen, 12 hours to a $\frac{1}{2}$ day are all remnants of this twelve base (duodecimal) system.

Key: **1.** 10 pennies + 3 pennies = 13 pennies; 13. **2.** 10 pennies + 4 pennies = 14 pennies; 14. **3.** 10 pennies + 5 pennies = 15 pennies; 15. **4.** 11; 12; 16; 17; 18; 19. **5.** 10 pennies + 10 pennies = 20 pennies; 20; 20. **8.** Four and ten; seven and ten; five and ten.

Page 29

Aim: To reteach counting by tens to 100

Suggestions: Once again the tens nature of our number system is stressed. This page may be correlated with number cards or a place pocket chart. For instance, twenty is 2 tens or 20; thirty is 3 tens or 30, and so on. The number chart on the next page will assist in this learning. This is an early beginning for building readiness for the later teaching of the decimal system. Do not hesitate to use the word *decimal* in oral situations, but do not expect the pupil to use the word frequently. The basic understanding at this point is: Every number greater than 9 is expressed as a combination of two (or more) figures, no one of which is ever greater than 9.

A correlative learning is the use of zero as a place holder. A place pocket chart can be made of wood or oilcoth, with two, three, or more sections. The first section at the extreme right is labeled "ones"; the next one is "tens," and so on. When you wish to represent the number 26, place 6 sticks in the ones pocket and 2 bundles of 10 sticks each in the tens pocket. Notice that the tens pocket *has bundles or groups of tens in it.* Some teachers have experimented with the use of different colors for the ones and tens. Since children do not readily grasp the idea that a change in color stands for tens, the group of tens is recommended.

Workbook Reference: Arithmetic Workshop, Book 3, page 1

Key: **2.** 3 tens; 4 tens; 5 tens; 6 tens; 9 tens. **5.** 5; 8.

Page 30

Aim: To show the organization of the numbers from 1 to 100 on a hundred chart

Suggestions: Pupils can help in the construction of a hundred chart and learn how the numbers are organized at the same time. A piece of plywood can be used as the board and cup hooks can be inserted. The pupils can write the numerals on pieces of cardboard and hang them in their proper places on the chart. The numeral tags can then be removed as desired and the children tested on their knowledge of number sequences. A firm groundwork at this time in the tens nature of our number system facilitates the explanation of carrying in addition and regrouping in subtraction which will be presented shortly. It also prepares a firm base for future work with decimal fractions.

Workbook Reference: Arithmetic Workshop, Book 3, page 7

Key: **2.** 3 tens, 6 ones. **3.** 68; 94. **4.** 40, 92. **5.** 70, 60. **6.** 8, 3. **7.** 3, 8.

Page 31

Aim: To extend the work on page 30

Workbook Reference: Arithmetic Workshop, Book 3, page 3

Key: **1.** 100 pennies. **3.** 74, 18. **4.** 58, 45. **5.** 26, 72. **6.** 93, 100. **7.** 26, 51, 72. **8.** 47, 38, 84. **9.** 93, 65, 29. **10.** 39; 93. **11.** 10; 99.

Page 32

Aim: To reteach the addition of 2-figure numbers with emphasis on place value

Suggestions: Pupils are motivated by the reference to money, and place value is explained in terms of dimes and pennies. As this is an excellent way to explain many of the intricate situations involving place value, it is best at this point to use the wall pocket chart with the large money used in enriching the teaching of page 4. Stress again and again the fact that pennies are added to pennies and dimes to dimes. Ex. 3 and 4 provide ample practice opportunities for those who have not as yet achieved satisfactory understanding of this idea.

Page 32 is the first page which refers to the "More Practice" pages. See page 327 of the text, "Supplementary Exercises," for an explanation of how to use these pages.

Workbook Reference: Arithmetic Workshop, Book 3, page 8

Key: **3.** 59¢, 88¢, 65¢, 69¢, 59¢, 89¢. **4.** 98¢, 87¢, 98¢, 89¢, 69¢, 97¢.

Page 33

Aim: To extend the work on page 32 to include abstract numbers

Suggestions: It is a relatively simple step from the dime and penny situation on page 32 to the tens and ones situations on this page. Keep stressing the fact that you add ones to ones and tens to tens. Allow the children to say as they add, "5 ones and 4 ones are 9 ones," "3 tens and 2 tens are 5 tens," and so on. Time spent on insuring a thorough understanding at this point will be well invested when you approach the concept of carrying.

Key: **2.** 45, 67, 96, 87, 98, 56, 29, 97. **3.** 68, 99, 78, 65, 89, 76, 74, 43. **4.** 62, 39, 97, 78, 94, 87, 79, 86.

Page 34

Aim: To review counting by dimes and nickels

Suggestions: Besides providing practice in counting by dimes and nickels, this lesson provides readiness for multiplication of 10 and 5 later in the text. As a follow-up activity you may wish to have the pupils organize their discoveries in tables, as follows:

1 ten = 10
2 tens = 20
3 tens = 30
and so on

1 five = 5
2 fives = 10
3 fives = 15
and so on

1 ten + 1 five = 15
2 tens + 1 five = 25
3 tens + 1 five = 35
and so on

Have the pupils check their work using the counting chart on page 30.

Key: **1.** 50¢. **2.** 6 dimes = 60 cents; 8 dimes = 80 cents. **3.** 70 cents. **4.** 25¢. **5.** 35¢. **6.** 10; 30. **7.** 30; 90. **8.** 15. **9.** 14. **10.** 10. **11.** 5¢ + 1¢ = 6¢. **12.** 5 × 5¢ = 25¢.

Page 35

Aim: To extend understanding of two-place numbers

Suggestions: Have the pupils demonstrate the meaning of two-place numbers with objective materials such as tongue depressors or ice cream sticks that can be bundled by tens. Put a rubber band around each group of ten. When the pupils understand how to do this, have them make dot diagrams as suggested in ex. 10. Also have the pupils illustrate the meaning of two-place numbers on a bead frame or hundred chart.

Key: **1.** 2; 5; 25. **2.** 3; 2; 32. **3.** 5; 5; 55. **4.** 6, 2; 97. **5.** 4, 9; 83. **6.** 9, 4; 90. **7.** 7, 0; 35. **8.** 60. **9.** 59. **10.** 4; 3.

Pages 36–37

Aim: To redevelop the subtraction of two-place numbers (no regrouping)

Suggestions: Present these pages in the same manner as pages 32–33. Emphasize place value. Although it is easy for pupils to subtract mechanically and get the right answers on these pages, time spent in emphasizing place value at this level will prove beneficial when more difficult examples are encountered later. Stress that ones are subtracted from ones and tens from tens.

Workbook Reference: Arithmetic Workshop, Book 3, page 15

Key: Page 36 **3.** 23¢, 23¢, 23¢, 24¢, 54¢, 11¢. **4.** 43¢, 12¢, 44¢, 31¢, 41¢, 65¢. Page 37 **3.** 42, 21, 31, 14, 63, 12, 54, 75. **4.** 25, 84, 31, 24, 42, 31, 31, 12. **5.** 22, 13, 13, 45, 71, 47, 23, 11.

Page 38

Aims: To prepare for the chapter test; to provide more practice in adding and subtracting 2-figure numbers

Suggestions: Watch the pupils' study habits. Have them "talk out" some of their work so that you can tell if they have mastered the adding of ones to ones and tens to tens. Listen carefully to their oral thought processes. *Watch especially* to see if they are adding or subtracting the tens numbers before the ones. If so, change the direction of their operation, as later work in regrouping depends on a left-to-right rather than a right-to-left performance pattern.

Key: **1.** 98¢ − 75¢ = 23¢. **2.** 12 chickens + 15 chickens = 27 chickens. **3.** 25 tickets − 13 tickets = 12 tickets. **4.** 59¢ − 35¢ = 24¢. **5.** 56, 78, 97, 87, 59, 45, 99. **6.** 99, 74, 58, 96, 82, 73, 68. **7.** 57, 12, 23, 23, 23, 11, 16. **8.** 48, 11, 56, 23, 31, 54, 46. **9.** 42, 17, 61, 22, 32, 42, 35.

Page 39

Aim: To provide a comprehensive review of the basic understandings and skills retaught in Chapter 1

Key: **1.** 10, 8, 4, 9, 6, 3, 9. **2.** 86, 76, 99, 78, 68, 95, 38. **3.** 51, 33, 14, 24, 15, 12, 42. **4.** 66, 26, 99, 97, 26, 78, 73. **5.** 5 cents. **6.** 10 cents. **7.** 45 cents. **8.** 40 cents. **9.** 36. **10.** 19. **11.** 46. **12.** 64. **13.** 7 ones; 7 tens; 0 ones. **15.** 30, 40, 50, 60, 70, 80; 20, 30, 40, 50, 60, 70, 80, 90. **16.** 25, 35, 45, 55, 65, 75, 85; 32, 42, 52, 62, 72, 82, 92. **17.** 5, 10, 15, 20, 25, 30, 35, 40, 45, 50; 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100. **18.** 8, 13, 18, 23, 28, 33, 38, 43, 48, 53; 17, 22, 27, 32, 37, 42, 47.

Page 40

Aim: To present Problem Test 1, designed to test ability to solve one-step word problems involving simple addition and subtraction thought patterns

Key: **1.** 5¢ + 4¢ + 1¢ = 10¢. **2.** 3 flowers + 5 flowers + 2 flowers = 10 flowers. **3.** 10 flowers − 4 flowers = 6 flowers. **4.** 15 + 14 = 29 (children). **5.** 36 boxes − 12 boxes = 24 boxes. **6.** 8¢ + 2¢ = 10¢. **7.** 11 hens + 14 hens = 25 hens. **8.** 9 balloons − 6 balloons = 3 ballons. **9.** 4 rabbits + 2 rabbits = 6 rabbits. **10.** 75¢ − 22¢ = 53¢.

Chapter 2

Aims of Chapter 2. The major aims of Chapter 2 are to:

1. Teach by the relationship method the 36 addition facts and the 36 subtraction facts whose sums and minuends are greater than 10.
2. Teach the zero facts in addition and subtraction by generalization.
3. Teach the addition and subtraction of 2-figure numbers in which the sum or minuend in the tens place is greater than 10.
4. Extend the understanding of place value through the hundreds.
5. Use numbers greater than 100 but less than 1000.
6. Extend subtraction thought patterns to include such expressions as: "how much less," "how many fewer."
7. Extend the knowledge of coin equivalents to include the quarter, half-dollar, and dollar.
8. Increase the specialized arithmetical vocabulary of the pupil.
9. Provide problem-solving situations in which the pupils identify the process to be used in the solution of the problem.

Since the teaching of the addition and the subtraction facts to the point of mastery is one of the major tasks of the third grade, some information concerning important methods of teaching these facts will precede the suggestions for teaching the text.

New Ways to Teach the Addition Facts. There are 100 addition facts, of which 64 have sums of 10 or less and are regarded as the easiest. These 64 facts are reviewed in Chapter 1 of the text; it is assumed that these easier addition facts are taught, at least informally, in Grade 2. The remaining 36 addition facts, which have sums over 10, are regarded as the hardest addition facts and are presented in Chapter 2 of the text. The usual method of teaching the 36 hardest facts is to develop them through the use of objects and then to drill upon them in a mechanical way until they are memorized. The newer method of teaching these facts is to make use of number relationships to facilitate the learning and the memorization of these facts. In this way it becomes possible to master a group of 8 or more difficult addition facts by the aid of one relationship instead of learning each of these facts separately by the drill method.

The relationship plan of teaching the addition facts has been found to be far superior to the drill plan. One of the extensive researches on this subject is that conducted in the Detroit schools by C. L. Thiele, who found that control groups required 50% more time to learn the addition facts by the drill plan than by the relationship plan. See Dr. Thiele's book *The Contribution of Generalization to the Learning of the Addition Facts*, Teachers College, Columbia University, New York, 1938.

To teach the hardest addition facts through number relationships, the authors of *American Arithmetic, Grade 3* have divided them into these groups:

Group			*Number of Facts*	*Taught in Text on*
A	Doubles	6 7 8 9 6 7 8 9	4	pages 41–42
B	Near Doubles	5 6 7 8 6 7 8 9 and reverses	8	pages 44–45
C	Adding 9	9 9 9 9 9 9 2 3 4 5 6 7 and reverses	12	pages 62–63
D	Adding 8	8 8 8 8 3 4 5 6 and reverses	8	pages 74–75
E	Miscellaneous	7 7 4 5 and reverses	4	page 82

The method of using relationships to teach each of these groups of facts is fully explained in the text on the pages listed above as well as in the suggestions for teaching those pages.

In developing each of the groups of facts, objects should be liberally used at first in order to give *meaning* to the facts and to develop the relationship that is to be used. After this preliminary work is completed, the important step of memorizing these facts begins. It is in this memorization stage that the use of number relationships is so effective, because it enables the pupil to give the answer to each fact *mentally* without being obliged to resort to recounting objects. Wide experience shows that the method of memorizing the addition facts merely by repeating them in a mechanical way is a costly one in which the pupil is tempted to guess, giving the wrong answer as often as the right one. It is this mixture of right and wrong responses that delays the final memorizing of the correct response. If the pupil always gives the right response, the time required to memorize the answer is greatly shortened. This is what happens in using number relationships — guessing is eliminated and wrong responses are avoided. There is another element that enters into the relationship plan that is entirely absent in the older plan — the element of *interest*. In the relationship plan the pupil's mind is alert; he *has* to think, and he is thoroughly interested in the intellectual challenge that the relationship involves. In the old drill plan, there is nothing to do but play the part of a phonograph with no element whatever to stimulate the imagination.

At this point it is important to emphasize the fact that the use of number relationships is a *means* to an end and not an end in itself. As soon as the pupil can give promptly the answer to an addition fact, he no longer needs to use number relationships. The pupil does need to use these relationships, however, as long as he gives hesitant or incorrect responses.

Mathematical Principles. Learning addition facts in a meaningful manner through understanding of number relationships is grounded upon two fundamental mathematical principles, the *commutative* and *associative principles of addition*. Continued emphasis will be placed in this chapter upon *the commutative principle of addition* since it is completely logical that an addition combination and its reversal be presented at the same time. Teaching the reversals at the same time, such as $7 + 2$ and $2 + 7$, reduces by almost one half the load of learning addition facts. For a more complete description of this principle, see pages 8 and 15 of the text and the teaching suggestions for those pages in the Guide.

Because of the *associative principle of addition,* it is possible to find the sum of an unknown addition combination by mentally associating it with a known addition fact that is nearly the same. For example, if it is known that $8 + 8 = 16$, the sum of $8 + 9$ may be found in the following manner: "$8 + 9 = 8 + (8 + 1) = (8 + 8) + 1 = 16 + 1 = 17$." For a more complete discussion of this important principle consult the suggestions in the Guide for teaching pages 18 and 19.

There is no need to formally name or symbolize these important principles at this time. Instead they should be presented informally in simple but meaningful language and thus become an integral part of the child's thought processes. It should be remembered that the ability to do abstract thinking is dependent upon a wealth of rich conceptual experiences. However, at this grade level more and more emphasis should be directed from the manipulative and visual levels of operation to the mental level, not forgetting that some children may need to use objective materials for some time yet.

Presenting the Subtraction Facts. Since subtraction is the inverse operation of addition, subtraction facts in the text are integrated with the corresponding addition facts. If a child has trouble remembering the answer to $17 - 9$, he should know how to think, "9 and what number are 16?" Other mental thought processes should be encouraged, such as, "$17 - 10 = 7$, so $17 - 9 = 7 + 1 = 8$;" and "$17 - 7 = 10$, so $17 - 9 = 10 - 2 = 8$." These and other ideas will be discussed more fully in the following suggestions for teaching Chapter 2.

Pages 41–42

Aim: To present 4 new addition facts known as the doubles, with sums greater than 10

Suggestion: Experience shows that children learn the doubles with great facility. At the beginning, develop these facts through the liberal use of objects. The doubles form an important group of facts because another group of new addition facts, presented on pages 44 and 45 of the text, can be easily learned by relating them to the doubles.

Workbook Reference: Arithmetic Workshop, Book 3, page 18

Key: Page 41 **1.** $6 + 6 = 12$ (sandwiches); 12 sandwiches; 12. **2.** 7¢ + 7¢ = 14¢; 14¢; 14. **3.** 12, 14, 12, 14.

Page 42 **1.** 16 buttons; 16 buttons; 16. **2.** 18 hats; 18 hats; 18. **3.** 8 stars + 8 stars = 16 stars. **4.** 9 dots + 9 dots = 18 dots. **5.** 7 eggs + 7 eggs = 14 eggs. **7.** 12, 18, 10, 14, 8, 16, 4, 6. **8.** 18, 16, 12, 14. **9.** 10, 6, 8, 2.

Page 43

Aim: To teach the 4 new subtraction facts that correspond to the doubles presented on pages 41 and 42

Suggestions: This page deserves careful study since it shows how an addition fact, such as 6 and 6 are 12, is used to develop the corresponding subtraction fact, 6 from 12 is 6. This relationship may be illustrated by first putting together two groups of 6 objects each, making 12 objects, and then taking one group of 6 objects away from the 12 objects to show that 6 objects are left. The other three facts in this group should be developed objectively in similar manner.

Observe which pupils have not yet mastered the "from" idea in subtraction. This language pattern was introduced first on page 12 of the text. It should be noted that when "from" is used, the subtrahend is named first and then the minuend. Whereas when "take away" is used, the minuend is named first and then the subtrahend. While "from" is not used as frequently as "take away" in stating subtraction facts, it becomes the predominant language pattern when working subtraction examples arranged in vertical form. The authors are aware that some pupils are promoted to the upper grades without clearly understanding that both language patterns involve the same concept, *i.e.*, diminishing the size of a group.

Workbook Reference: Arithmetic Workshop, Book 3, page 19

Key: **1.** 6 stars; 6. **2.** 7 circles; 14, 7. **3.** 8 dots; 16, 8. **4.** 9 dots; 18, 9. **5.** 7, 4. **6.** 6, 2. **7.** 9, 1. **8.** 5, 3. **9.** 8, 9. **10.** 7, 8. **11.** 6, 8, 7, 5, 9, 7, 8, 4. **12.** 5, 6, 8, 9, 6, 9, 7, 3.

Pages 44–45

Aim: To teach 8 new addition facts called the *near doubles* by relating them to the doubles

Suggestions: A fact like 5 and 6 is called a *near double* because it is nearly like 5 and 5. Another *near double* is 6 and 7 because it is nearly like 6 and 6. In a double like 6 and 6, both numbers are alike. In a near double like 6 and 7, one number is 1 more than the other. Pages 44 and 45 show the pupil how his knowledge of the doubles enables him quickly to learn the near doubles. For example, if the pupil knows that 5 and 5 are 10, it is easy for him to see that 5 and 6 are 11. Similarly, if he knows that 6 and 6 are 12, it is easy for him to see that 6 and 7 are 13. The relationship between a double and its near double should first be illustrated by objects. Start with objects representing 5 and 5 and show that the sum is 10. Then add 1 to one of the 5's, making 5 and 6, and show that the sum is 1 larger than 10, or 11. Repeat this illustration with objects representing 6 and 6 and show that if one of the 6's is increased by 1, the sum is also increased by 1.

When addition facts like 6 and 7 are 13 or 7 and 8 are 15 are learned as isolated facts, they are regarded as difficult facts; but they become relatively easy if each is learned by relating it to its corresponding double.

In practice and drill exercises, if a pupil forgets the answer to a near double like 7 and 8, ask him, "How many are 7 and 7?" Then ask, "How many are 7 and 8?" When a pupil learns that 7 and 8 are 15, he also knows by the commutative principle that 8 and 7 are 15. On pages 44 and 45, each of the near doubles is given with its reverse; hence 8 new facts are presented on these pages. The relationship of a near double to its double is to be used only in developing a correct response to a near-double fact, or when such a fact has been forgotten. When a pupil is asked to give the sum of 7 and 8, he should not be required to relate it to 7 and 7 if he already remembers that the answer is 15. The final aim should be the automatic response 15; when that is obtained, there is no further need of objects or relationships as an aid to finding the sum.

Key: Page 44 **1.** 5 planes + 5 planes + 1 plane = 11 planes; 10; 11; 10, 11; 11; 11. **2.** 13 planes; 12; 13; 13; 13.

Page 45 **3.** 14; 15; 15; 15. **4.** 16; 17; 17; 17. **5.** 12, 13; 13; 13. **6.** 14, 15; 15; 15. **7.** 16, 17; 17; 17. **9.** 11, 15, 17. **10.** 13, 11, 13. **11.** 17, 9, 15.

Page 46

Aim: To provide additional practice on doubles and near doubles

Workbook Reference: Arithmetic Workshop, Book 3, pages 20 and 21

Key: **1.** 12, 13. **2.** 16, 17. **3.** 14, 15. **4.** 10, 11. **5.** 6, 7. **6.** 12, 13. **7.** 4, 5. **8.** 16, 17. **9.** 13 children; 13. **10.** 17 flowers. **11.** 15. **12.** 15. **13.** 11. **14.** 11, 17, 9, 14, 7, 11, 13, 7. **15.** 6, 13, 15, 17, 11, 9, 18, 15. **16.** 15, 12, 17, 8, 5, 16, 13, 10.

Page 47

Aim: To teach how to find *how many more are needed* in problem situations

Suggestions: Lead the pupils to see that problems of this type are very much like addition situations with which they are familiar, except that one of the addends is missing. The missing addend can be found by counting, by knowledge of the basic addition fact, or by subtraction. Point out that the first two methods would be much too slow when more difficult problems are encountered, and hence problems of this type should be solved by subtraction. For example, the best way to find the missing addend in the number sentence 31 + □ = 78 is to subtract 31 from 78. Since problems of this type involve the concept of addition, but are generally solved by subtraction, they are often said to involve the *additive concept of subtraction*. The practice of having pupils write a number sentence describing the idea behind a problem as in ex. 1 is strongly recommended. It is not necessary for pupils to label the box as shown. It is sufficient for them to write 6 + □ = 8. Explain that the box is merely written to hold the place of the missing addend. Having written this sentence, it should then be a simple matter for pupils to see that the missing addend can be found by subtraction.

Key: **2.** 12 cookies. **3.** 24¢.

Pages 48–49

Aim: To teach 8 new subtraction facts which correspond to the 8 addition facts (*near doubles*) taught on pages 44–45

Suggestions: There are two ways to assist children in discovering subtraction facts: (1) by associating the facts with previously learned addition facts; (2) by counting and grouping objects. Both of these plans are used in most classrooms. Pupils with higher degrees of abstract intelligence will choose the first plan (and can be grouped accordingly), whereas the others will feel more secure in the manipulation of concrete objects. Dividing the class into two groups for such activities tends to make the teaching-learning situation more efficient and gives status to the better pupil and security to the slower one. By either plan, you are encouraging the pupil to *discover* the answer rather than to repeat the answer told him.

Key: Page 48 **1.** 11 bells − 5 bells = 6 bells; 6 bells; 6; 5; 6; 5. **2.** 13 stars − 6 stars = 7 stars; 7 stars; 7, 6, 7, 6. **3.** 15 dots − 7 dots = 8 dots; 8 dots; 8; 7; 8; 7.

Page 49 **4.** 9; 9; 9; 8; 9; 8. **5.** 6, 6. **6.** 6, 6. **7.** 9, 9. **8.** 7, 7. **9.** 8, 8. **10.** 7, 7. **11.** 5, 5. **12.** 8, 8. **13.** 9, 9. **14.** 8, 5, 7, 8, 7, 6, 7, 9. **15.** 6, 7, 8, 7, 5, 8, 6, 8. **16.** 9, 6, 9, 6, 7, 8, 9, 7.

Page 50

Aim: To review the new subtraction facts taught in Chapter 2

Suggestions: Observe carefully the work habits of the pupils in completing ex. 6–9. Plan reteaching programs for those who do not easily master this work.

Workbook Reference: Arithmetic Workshop, Book 3, page 22

Key: **1.** 15 cards − 7 cards = 8 cards; 8. **2.** 16¢ − 8¢ = 8¢. **3.** 13¢ − 6¢ = 7¢. **4.** 18¢ − 9¢ = 9¢. **5.** 15¢ − 8¢ = 7¢. **6.** 5, 3, 4, 5, 9, 6, 6, 8. **7.** 2, 5, 2, 7, 7, 2, 8, 6. **8.** 2, 2, 4, 7, 6, 9, 7, 7. **9.** 5, 3, 1, 8, 5, 6, 4, 8.

Page 51

Aim: To help pupils decide which problems should be solved by addition and which should be solved by subtraction

Suggestions: This is the first time in the text that both addition and subtraction problems have been intermingled on the same page. The objective is to challenge the pupil to think discriminately about quantitative situations and make intelligent decisions with regard to which operation to use in solving each problem. It is suggested that the teacher work orally with the pupils in reading and analyzing at least the first six problems before assigning the page for written work.

In this way the teacher can determine which pupils need additional help in interpreting the arithmetic operations suggested by such questions as: "How many are left?" "How many are there in all?" "How many are there all together?" "How much more is needed?" "How many are left?" and so on.

Pupils should be encouraged to make up problems similar to the ones they have solved. Capitalize upon addition and subtraction situations that occur in the classroom or daily environment of the pupils.

Key: **1.** 16¢ − 8¢ = 8¢. **2.** 62¢ + 25¢ = 87¢. **3.** 9 rolls + 9 rolls = 18 rolls. **4.** 75¢ − 53¢ = 22¢. **5.** 8¢ + 9¢ = 17¢. **6.** 96 pages − 25 pages = 71 pages. **7.** 3¢ + 5¢ + 2¢ = 10¢. **8.** 15 tops − 7 tops = 8 tops. **9.** 12 pages + 14 pages = 26 pages. **10.** 75¢ − 33¢ = 42¢. **11.** 4 pencils + 1 pencil + 3 pencils = 8 pencils. **12.** 18¢ − 9¢ = 9¢.

Page 52

Aims: To solve problems involving the comparison concept of subtraction; to identify the language patterns associated with this concept

Suggestions: Have the pupils objectify ex. 1–3 by placing two groups of counters on their desks to represent the numbers in each problem. It should be noted that in the comparison concept of subtraction it is proper to objectify both groups. Basically the concept here involves a one-to-one matching of the elements in one group with the elements in the other group. The number of unmatched elements in the larger group represents the *difference* between the two groups. Point out that to find out *how many more* or *how many fewer* there are in one group than the other we subtract. While the answers to ex. 1–3 could be found by counting or by knowledge of the addition facts, the only practical solution to more difficult problems such as ex. 4–5 is to subtract.

To encourage understanding of the comparison concept, have the pupils state many subtraction facts in this manner: "The difference between ____ and ____ is ____." "____ is ____ more than ____." "____ is ____ less than ____."

Key: **1.** 4 marbles; 4 marbles; 4; 4; 4; 4; 4. **2.** 2; 2. **3.** 3. **4.** 55. **5.** 66.

Page 53

Aim: To extend the comparison concept of subtraction to include problems involving the comparison of amounts of money

Suggestions: Before introducing the lesson, have the pupils compare two amounts of money using play coins to objectify each amount. Point out the similarity of these problems to those on page 52. In the case of money we ask "how much more" or "how much less," instead of "how many more" or "how many fewer" as was appropriate on page 52. In ex. 3–9, have the pupils state each question in a different way.

Workbook Reference: Arithmetic Workshop, Book 3, page 31

Key: **1.** Airplane; 39¢ − 15¢ = 24¢; 24¢; 24¢. **2.** 11¢; 11¢. **3.** 22¢. **4.** 11¢. **5.** 4¢. **6.** 33¢. **7.** 8¢. **8.** 32¢. **9.** 23¢.

Page 54

Aims: To discover number relationships in the number patterns; to find the number that was subtracted

Suggestions: In case pupils have forgotten how to complete the number patterns, have them study again pages 22 and 25. Patterns 3–4 provide the added challenge of finding missing numbers that are necessary to complete the patterns. Although carrying in addition has not yet been taught, you may have a bright pupil capable of discovering that the sums of the numbers in the outside rows or columns are the same. Ask the pupils to explain why the numbers directly across from each other in the outside rows or columns are the same. This provides a good opportunity to review the *commutative principle of addition* studied previously on pages 8 and 15.

Lead the pupils to see that the missing numbers on the lower half of the page can be found by subtraction. Point out in ex. 1 that the missing number and 8 can be thought of as addends that together make 17. Consequently the order of the addends can be changed, thus making it possible to subtract 8 from 17 to find the missing number.

Key:

1.

14	9	15	10
15	7	8	15
9	2	7	9
10	9	15	14

2.

16	17	17	18
17	8	9	17
17	9	8	17
18	17	17	16

3.

12	10	9	7
9	6	3	9
10	4	6	10
7	10	9	12

4.

9	8	6	5
7	5	2	7
7	3	4	7
5	8	6	9

1. 9, 9, 9, 9, 9, 9. **2.** 7, 5, 6. **3.** 6, 7, 8. **4.** 9, 7, 8.

Pages 55–57

Aims: To extend the basic understanding of place value to the hundreds place; to read and use numbers greater than 100

Suggestions: To date, the pupil has been concerned with only tens and ones. Now the concept of 10 tens or 1 hundred is introduced. Bundles of sticks or pencils are sometimes used to illustrate the meaning of 3-figure numbers. There should be large bundles of 100 sticks (grouped within the bundle as 10 groups of 10), smaller bundles of 10 sticks each, and single sticks. The number 165 would be represented by the bundle of 100 sticks, 6 smaller bundles of 10 each, and 5 single sticks. Discussion of this visual presentation brings the pupil to the realization that the number 165 can be discussed in three ways:

1. As 165 single sticks
2. As 1 hundred, 6 tens, and 5 ones
3. As 16 tens and 5 ones

Much practice is needed on these three ways to represent a 3-figure number as preparation for later work in carrying in addition and regrouping in subtraction. Besides using bundles of sticks, a place value pocket chart or an abacus having vertical columns can be used effectively to represent numbers. Large play coins can be inserted in a pocket chart to represent amounts of money involving dollars, dimes, and pennies. Thus it can be shown that 165 pennies have the same value as 1 dollar, 6 dimes, and 5 pennies. Continually emphasize the *tens nature* of our number system so that children will intuitively appreciate how our number system has a built-in system of place values based upon powers of ten.

Key: Page 55 **1.** 10, 20, 30, 40, 50, 60, 70, 80, 90, 100. **2.** 10, 20, 30, 40, 50, 60. **7.** 1 hundred, 8 tens, 4 ones; 18 tens, 4 ones.

Page 56 **1.** 300, 400, 500. **2.** 547; 5, 4, 7. **3.** 8 hundreds, 7 tens, 1 one; 9 hundreds, 2 tens, 6 ones. **5.** 8 hundreds, no tens, no ones; 6 hundreds, no tens, no ones. **6.** No ones. **7.** No tens.

Page 57 **1.** 2, 5, 6. **2.** 7, 3, 4. **3.** 8, 6, 0. **4.** 4, 0, 7. **5.** 9, 0, 0. **6.** 538; 74. **7.** 950; 35. **8.** 304; 90. **9.** 700; 69. **10.** 467; 40. **11.** 219, 460. **12.** 554, 612. **13.** 114, 900. **14.** Seven hundred twenty-eight, nine hundred four, three hundred fifty, six hundred fifteen, eight hundred. **15.** 7 hundreds, 2 tens, 8 ones; 9 hundreds, 0 tens, 4 ones; 3 hundreds, 5 tens, 0 ones; 6 hundreds, 1 ten, 5 ones; 8 hundreds, 0 tens, 0 ones. **16.** 100. **17.** 999. **18.** 763; 367.

Page 58

Aim: To teach addition of 2-figure numbers in which the sum of the tens figures is greater than 10

Suggestions: The work on this page is an extension of the basic understandings developed on pages 32–33. It follows closely the number meanings of the previous page. Be careful to explain very fully the example at the top right with emphasis on adding 9 tens and 8 tens and getting 17 tens (written as 1 hundred and 7 tens). Children will obtain a clearer picture of this idea if you use dimes and pennies. In the example, the story would then read: "2 pennies and 4 pennies are 6 pennies; 9 dimes and 8 dimes are 17 dimes; but 17 dimes are really 1 dollar and 7 dimes. So the answer becomes 1 dollar, 7 dimes, and 6 pennies."

Key: **2.** 136, 105, 109, 174, 119, 157, 105, 169. **3.** 108, 158, 107, 188, 148, 135, 119, 157. **4.** 148, 176, 119, 107, 178, 155, 128, 104. **5.** 179, 129, 106, 167, 134, 106, 103, 189.

Page 59

Aim: To teach subtraction of 2-figure numbers from 3-figure numbers, where the differences are 2-figure numbers (no changing required)

Suggestions: This page follows closely from the work of the previous page. In modern mathematics, subtraction is referred to as the *inverse operation of addition*. From one point of view the examples on this page can be viewed as cases where one of the addends is missing, with subtraction being the proper operation for finding the missing addend. However, the examples can also be viewed as cases where minuend and subtrahend are given, and the remainder or difference must be found.

Some teachers may consider this to be the first step in introducing the regrouping process which is presented later on page 146 of the text. However, changing is not required since the minuends may be viewed as tens and ones. In ex. 1, for example, 158 may be simply interpreted as 15 tens and 8 ones. This procedure is recommended at this time.

Workbook Reference: Arithmetic Workshop, Book 3, pages 23 (ex. 8–11) and 29 (ex. 5–8)

Key: **2.** 86, 71, 74, 82, 63, 63. **3.** 81, 65, 46, 95, 14, 54. **4.** 51, 62, 88, 71, 95, 72. **5.** 92, 63, 81, 62, 31, 84. **6.** 94, 75, 62, 23, 73, 81.

Page 60

Aim: To test ability to distinguish between addition and subtraction thought patterns in dealing with word problems

Suggestion: This is a continuation of the work started on page 51. At that time you read and discussed the word problems with the class. This time let the class work alone, but provide the slow reader with help in reading the problems. Also, give individual assistance to those who did not fully grasp the work on page 51. Be sure to let the pupils suggest additional problems which arise from their daily experiences.

Key: **1.** Add; $6 + 5 = 11$ (children). **2.** Subtract; 25¢ – 14¢ = 11¢. **3.** Add; 3 dolls + 2 dolls = 5 dolls. **4.** Subtract; 10¢ – 5¢ = 5¢. **5.** Subtract; 36 cookies – 24 cookies = 12 cookies; 12; 12. **6.** Subtract; 6 books – 4 books = 2 books. **7.** Add; 3 leaves + 4 leaves + 2 leaves = 9 leaves. **8.** Add; 15¢ + 44¢ = 59¢. **9.** Add; 5 cards + 6 cards = 11 cards.

Page 61

Aim: To present an objective test

Suggestion: This is the first objective test of the year, and for some children it may be the first one they have ever taken. The primary purpose of this lesson is to help pupils acquire the skill of taking an objective test. All the questions on this test are simple in nature and should prove easy for the pupil. Give specific directions before the class begins to work. Then walk around the room and guide them in the art of taking this type of test. Some teachers will prefer to do the first two or three questions orally with the class.

Key: **1.** Yes. **2.** No. **3.** No. **4.** Yes. **5.** No. **6.** No. **7.** Yes. **8.** Yes. **9.** No. **10.** No. **11.** Yes. **12.** Yes. **13.** Yes. **14.** Yes. **15.** Yes. **16.** Yes. **17.** No. **18.** No. **19.** No. **20.** Yes. **21.** Yes.

Pages 62–63

Aim: To teach 12 new addition facts involving adding 9 to a number

Suggestions: Addition facts like $9 + 5 = 14$ or $5 + 9 = 14$, in which 9 is one of the numbers to be added, have long been regarded as among the most difficult facts to learn. This is especially true if the pupil learns each of these facts in isolated form and merely commits it to memory. But if he learns to relate 9 and 5 to 10 and 4, as shown on page 62, he finds it relatively easy to remember that 9 and 5 are 14. In presenting this new work, start with actual objects representing 9 and 5, or draw pictures of objects on the board. Show the pupils how 9 and 5 can be changed to 10 and 4, as explained in ex. 1 on page 62. Repeat this illustration for 9 and 6, 9 and 4, and so on, with objects. After the principle involved is fully understood, show how to *add the numbers mentally,* as explained in the box near the top of page 63. You will recall having taught $9 + 8 = 17$ as one of the near doubles, page 45.

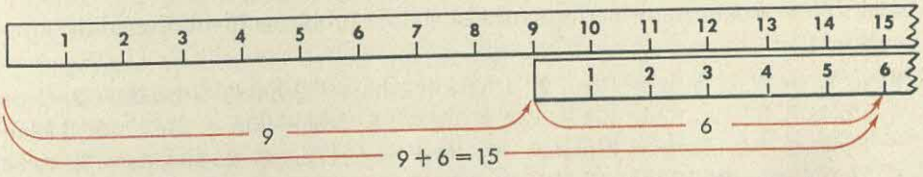
Key: Page 62 **1.** 2, 12, 12, 12. **2.** 15, 15, 15. **3.** 3, 13, 13, 13. **4.** 4, 14, 14, 14. Page 63 **5.** 6, 16; 16; 16. **6.** 11; 11. **7.** 18; 17. **9.** 6, 16. **10.** 5, 15. **11.** 3, 13. **12.** 4, 14. **13.** 5, 15, 15. **14.** 6, 16, 16. **15.** 2, 12, 12. **16.** 4, 14, 14. **17.** 3, 13, 13.

Pages 64–65

Aims: To illustrate number facts and relationships on a number line; to provide further practice in adding 9 to a number

Suggestions: Obtain a commercially prepared number line or make one and mount it in a convenient place for easy reference. It would be a good idea to mount the number line just above the chalkboard so that brackets can be drawn below to represent the numbers that are added or subtracted. A number line is an invaluable device in teaching number relationships and frequent reference should be made to it. A number line emphasizes the concept of a number as a *magnitude* as opposed to simply a collection of objects in a group. This concept is fundamental to linear measurements of many types.

A very useful type of slide rule for illustrating addition and subtraction facts can be easily constructed of cardboard or plywood and labeled as shown below. The slide rule consists very simply of two number scales which can be adjusted in various positions as desired.



Workbook Reference: Arithmetic Workshop, Book 3, pages 24 and 25

Key: Page 64 **1.** 15, 14. **2.** 16, 15. **3.** 13, 12. **4.** 18, 17. **5.** 17, 16, 16. **6.** 12, 11, 11. **7.** 14, 13, 13. **8.** 19, 18, 18. **9.** 12, 12, 16. **10.** 14, 14, 13. **11.** 17, 18, 17. **12.** 15, 16, 15.

Page 65 **1.** $9 + 9 = 18$ (children). **2.** $9 + 2 = 11$ (children). **3.** $9 + 5 = 14$ (children). **4.** 7, 17; page 45; page 42. **5.** 16, 14, 12, 13, 15. **6.** 13, 18, 11, 17, 12. **7.** 15, 11, 17, 14, 16. **8.** 12, 14, 18, 11, 16, 10, 13, 17, 15. **9.** 17, 10, 11, 13, 14, 15, 18, 14, 12. **10.** 15, 13, 14, 16, 15, 17, 11, 12, 16.

Pages 66–67

Aim: To provide a problem unit dealing with a visit to the park

Suggestions: In anticipation of this problem unit, bring to class pictures of animals familiar to the children. You might also determine the number of pupils who have visited a park or have seen a park on television. The pictures together with some personal experiences on park visits related by the pupils will set the stage for the problems on these pages. After a discussion of parks, direct the attention of the pupils to the problems in the textbook. All subsequent problem units should be approached in this way, and a definite interest in the unit aroused before pupils begin the problem work.

Workbook Reference: Arithmetic Workshop, Book 3, page 51

Key: Page 66 **1.** $9 + 9 = 18$ (children). **2.** $11 - 6 = 5$ (brown bears). **3.** 9 monkeys + 5 monkeys = 14 monkeys; $9 - 5 = 4$ (large monkeys).

Page 67 **4.** $15 - 7 = 8$ (birds with short tails). **5.** 5 lions − 3 lions = 2 lions; $5 - 3 = 2$ (lions). **6.** $2 + 2 + 5 = 9$ (farm animals). **7.** $7 + 6 = 13$ (children). **8.** 75¢ − 63¢ = 12¢.

Page 68

Aim: To provide an oral review of addition and subtraction facts taught thus far and of place value as it relates to 2- and 3-figure numbers

Key: **1.** 12, 13. **2.** 16, 17. **3.** 14, 15. **4.** 10, 11. **5.** 5, 15. **6.** 2, 12. **7.** 7, 17. **8.** 3, 13. **9.** 6, 16. **10.** 4, 14. **11.** 13, 13, 6, 7. **12.** 11, 11, 5, 6. **13.** 15, 15, 8, 7. **14.** 17, 17, 9, 8. **15.** 8 tens, 5 ones. **16.** 2 hundreds, 8 tens, 5 ones. **17.** 349. **18.** 1 hundred, 7 tens, 5 ones; or 17 tens, 5 ones. **19.** 7, 6. **20.** 9, 6. **21.** 7, 5. **22.** 9, 8.

Page 69

Aim: To evaluate pupil performance in simple problems involving addition and subtraction

Key: **1.** 3¢ + 4¢ + 3¢ = 10¢. **2.** 4 hats + 4 hats + 2 hats = 10 hats. **3.** 2 pets + 4 pets = 6 pets. **4.** 45¢ + 12¢ = 57¢. **5.** 58¢ − 35¢ = 23¢. **6.** 3 planes + 4 planes + 2 planes = 9 planes. **7.** 9¢ + 8¢ = 17¢. **8.** 85 tickets − 32 tickets = 53 tickets. **9.** 12, 15, 13, 12, 14, 13, 15, 13, 17. **10.** 13, 14, 11, 16, 15, 15, 11, 13, 11.

Pages 70–71

Aim: To present 12 subtraction facts corresponding to the 12 addition facts for the 9's

Suggestions: Stress the relationships which exist between these facts and the corresponding addition facts. See also the suggestions for teaching such pages as 43, 48, and 49.

Key: Page 70 **1.** 14; 5, 9. **2.** 9 stars; 9; 7 stars; 7, 9, 7. **3.** 3 pencils; 3; 9 pencils; 9, 3, 9. **4.** 5, 5. **5.** 3, 3. **6.** 7, 7. **7.** 9, 9.

Page 71 **8.** 9 stars; 9 stars; 9; 4 stars; 4 stars; 4. **9.** 9 dots; 9 dots; 9; 6 dots; 6 dots; 6. **10.** 9 bells; 9 bells; 9; 2 bells; 2 bells; 2. **11.** 9, 4, 9, 9, 7, 9, 3, 6.

Page 72

Aim: To review the addition and subtraction facts dealing with the 9's

Workbook Reference: Arithmetic Workshop, Grade 3, page 26

Key: **1.** 5, 5. **2.** 7, 7. **3.** 3, 3. **4.** 9, 9. **5.** 9, 9. **6.** 4, 4. **8.** $11 - 10 = 1$, $1 + 1 = 2$, $11 - 9 = 2$; $15 - 10 = 5$, $5 + 1 = 6$, $15 - 9 = 6$. **9.** 15, 16, 12, 8, 3, 9, 7, 9. **10.** 13, 17, 14, 4, 6, 9, 9, 9. **11.** 18, 15, 11, 9, 5, 9, 9, 9.

Page 73

Aim: To provide more experience with subtraction facts

Suggestions: Have ex. 1–9 done orally. Those who did not do too well with the work on page 59 should try to work ex. 10–13.

Key: **1.** 3, 6, 6, 6. **2.** 5, 8, 8, 9. **3.** 9, 7, 9, 7. **4.** 6, 4, 2, 5. **5.** 9, 7, 9, 9. **6.** 9, 7, 9, 8. **7.** 125 papers − 94 papers = 31 papers. **8.** 176 pages − 92 pages = 84 pages. **9.** 157 miles − 85 miles = 72 miles. **10.** 94, 71, 51, 91, 31, 84. **11.** 63, 83, 98, 92, 91, 92. **12.** 96, 55, 72, 42, 93, 61. **13.** 77, 83, 72, 73, 64, 55.

Pages 74–75

Aim: To teach the eight addition facts involving adding 8 to a number

Suggestions: Demonstrate with objects how a group of 8 objects and a group of 4 objects can be changed to a group of 10 objects and a group of 2 objects, or 12 objects in all. Then have the pupils explain how the picture tells this story. Point out that the top rectangle holds exactly 10 red disks. You may wish to write the following number sentence to show this change in another way: $8 + 4 = 8 + (2 + 2) = (8 + 2) + 2 = 10 + 2 = 12$. The parentheses are used as grouping symbols to denote that $(2 + 2)$ may be substituted for 4 and then to show that the grouping may be shifted to $(8 + 2)$. As explained previously, this change in the grouping of addends is permissible because of the *associative principle of addition* which states that the manner of associating the addends makes no difference in their sum. Stated with letters to represent any numbers, this principle becomes $a + (b + c) = (a + b) + c$. After a similar development of ex. 2, emphasize the generalization at the center of page 74. The pupils should then be ready to complete the rest of the two pages by themselves.

Key: Page 74 **1.** 12, 12. **2.** 3, 13, 13, 13. **3.** 1, 11, 11, 11. **4.** 3, 13. **5.** 2, 12. **6.** 1, 11.

Page 75 **7.** 4, 4, 14. **8.** 5, 15. **9.** 7, 17. **10.** Take 2 from 6; think 10 + 4 = 14. **11.** 8¢ + 3¢ = 11¢. **12.** 5 tickets + 8 tickets = 13 tickets. **13.** 9 tickets + 8 tickets = 17 tickets. **14.** 11, 16, 14, 9, 17, 15, 12, 10, 14. **15.** 13, 14, 11, 15, 12, 11, 10, 17, 15. **16.** 17, 10, 12, 11, 13, 15, 14, 16, 9.

Page 76

Aim: To provide further practice in the addition facts just taught

Workbook Reference: Arithmetic Workshop, Book 3, page 27

Key: **1.** 13, 13, 13. **2.** 1, 11, 11, 11. **3.** 4, 14, 14, 14. **4.** 2, 12, 12, 12. **5.** 8 books + 5 books = 13 books. **6.** 8 books + 6 books = 14 books. **7.** 8 planes + 4 planes = 12 planes. **8.** 3¢ + 8¢ = 11¢. **9.** 5; 7. **10.** 9; 3. **11.** 8; 8. **12.** 8; 8. **13.** 8; 8.

Page 77

Aim: To extend the teaching of coin equivalents to 25¢, 50¢, and $1

Suggestions: Use the toy money and the display coins to illustrate some of the easy equivalents. Stress what these various coins will buy. If the pupils wish to tell about some of their recent store experiences with these coins, encourage them to do so. You might suggest the construction of posters titled: "What 25¢ Will Buy," "What 50¢ Will Buy," and "What $1 Will Buy."

Key: **1.** (2 × 10¢) + 5¢ = 25¢. **2.** 25¢ ÷ 5¢ = 5 (nickels); 50¢ ÷ 5¢ = 10 (nickels). **3.** 2 dimes and 1 nickel or 1 dime and 3 nickels. **4.** 10; 100¢ ÷ 10¢ = 10 (dimes). **5.** 50 cents. **6.** 50¢ ÷ 25¢ = 2 (quarters). **7.** 50¢ ÷ 10¢ = 5 (dimes). **8.** 40¢ + 5¢ = 45¢. **9.** 25¢ + 10¢ = 35¢. **10.** 50¢ + 10¢ = 60¢. **11.** 10¢ + 3¢ = 13¢.

Page 78

Aim: To teach the 8 subtraction facts corresponding to the addition facts dealing with the 8's

Suggestions: Stress the association between these facts and the corresponding addition facts, and follow the suggestions for teaching such pages as 43, 48, and 49.

Key: **1.** 3, 3; 8, 8; 3; 8. **2.** 4, 4; 8, 8; 4; 8. **3.** 5, 5; 8, 8; 5; 8. **4.** 6, 6; 8, 8; 6; 8. **5.** 8, 3, 8, 7, 5, 8, 8, 8. **6.** 8, 4, 8, 8, 2, 6, 4, 8. **7.** 2, 3, 8, 6, 9, 8, 8, 7. **8.** 9, 5, 8, 8, 8, 8, 8, 8.

Page 79

Aim: To provide more practice on the subtraction facts taught in Chapter 2

Suggestion: Stress the oral approach to the work on this page.

Workbook Reference: Arithmetic Workshop, Book 3, page 28

Key: **1.** 8, 8. **2.** 6, 6. **3.** 8, 8. **4.** 3, 3. **5.** 8, 8. **6.** 8, 8. **7.** 11 pages − 8 pages = 3 pages. **8.** 15¢ − 8¢ = 7¢. **9.** 14 flowers − 6 flowers = 8 flowers. **10.** 12¢ − 4¢ = 8¢.

Page 80

Aims: To provide further practice in discerning addition and subtraction thought patterns; to provide further practice in recently taught addition and subtraction facts

Suggestion: Encourage the pupils to write just the answers to the word problems. In doing ex. 4–7, devise a plan for writing answers which will allow easy correction and yet be well organized.

Key: **1.** Add, 158 children. **2.** Add, 137 papers. **3.** Subtract, 82 pencils. **4.** 2, 5, 8, 8, 1, 15, 11, 2. **5.** 7, 3, 8, 8, 12, 17, 8, 14. **6.** 4, 9, 8, 8, 3, 13, 12, 16. **7.** 6, 8, 8, 8, 17, 4, 15, 13. **8.** Subtract, 32¢. **9.** Subtract, 16 books. **10.** Add, 117 buttons.

Page 81

Aims: To provide further practice in the skills taught on page 58 of the text; to show how to change horizontal column addition to the vertical form

Suggestions: Some teachers will see in ex. 6–9 an excellent opportunity to extend the mental arithmetic skills of the pupils. If the columns can be added horizontally, this skill could easily be extended at a later date to horizontal subtraction and multiplication. This suggestion is made as a supplementary activity for the more able members of the class.

Key: **1.** 148, 124, 169, 105, 159, 178, 149. **2.** 177, 139, 168, 157, 119, 147, 139. **3.** 155, 169, 128, 137, 186, 118, 156. **4.** 52 children + 54 children = 106 children. **5.** 75 pounds + 72 pounds = 147 pounds. **6.** 13, 15, 11. **7.** 11, 12, 16. **8.** 15, 14, 12. **9.** 14, 11, 13. **10.** \$4 + \$5 + \$4 = \$13. **11.** 7 points + 2 points + 4 points = 13 points.

Page 82

Aim: To teach the last 4 addition facts

Suggestion: In Chapter 2, 32 addition facts have already been taught. The remaining 4 may be developed by means of objects or by association. For instance, pupils already know that 7 + 3 are 10; therefore, they could, by association, reason that 7 and 4 are 11. As there is one more in an addend, there must be one more in the sum. In like manner, or by using the commutative principle, the corresponding fact 3 + 7 = 10 is easy. For the fact 5 + 7 = 12, a relationship could be shown with 6 and 7 = 13, reasoning that one more in an addend would net one more in the sum. However, the slower children will probably feel more secure if objects are used.

Key: **1.** 10, 11. **2.** 11, 11. **3.** 11, 12. **4.** 12, 12. **5.** 11, 11. **6.** 11, 11. **7.** 12, 12. **8.** 12, 12. **9.** 11; 11. **10.** 2, 12; 12; 12. **11.** 7 pennies + 4 pennies = 11 pennies. **12.** 7 dolls + 5 dolls = 12 dolls. **13.** 4 apples + 7 apples = 11 apples. **14.** 7 stars + 5 stars = 12 stars.

Page 83

Aim: To teach the last 4 subtraction facts corresponding to the addition facts taught on page 82

Workbook Reference: Arithmetic Workshop, Book 3, pages 30 and 31 (Part of the work on page 31 is correlated with page 52 of the textbook.)

Key: **1.** 4, 4; 7, 7; 4; 7. **2.** 5, 5; 7, 7; 5; 7. **3.** 7, 4, 7. **4.** 5, 7, 5. **5.** 12¢ − 5¢ = 7¢. **6.** 11 apples − 7 apples = 4 apples. **7.** 12 cookies − 7 cookies = 5 cookies. **8.** 11¢ − 4¢ = 7¢. **9.** 11, 4, 7, 11, 12, 5, 7, 12.

Page 84

Aim: To teach the zero addition facts by generalization

Suggestions: Use the closed-book approach to this lesson. You will notice that so far no reference has been made in teaching or in practice work to the zero addition facts. Some arithmetic authorities argue that these facts do not exist and therefore should not be taught. However, pupils do come in contact with zero facts in many ways; and although in *American Arithmetic, Grade 3*, no intensive drill is planned for the teaching of these facts, the generalization that "if you add a number and zero, the sum is the number" is an important concept in arithmetic. Pupils can be brought in a simple way to a realization of the obvious nature of this generalization. Reference to games in the classroom and to everyday school activities will suffice. After the children have made this generalization and you have written it on the board, have them open their books and copy and complete the number patterns. Completing these patterns should help emphasize that the order of adding a number and zero makes no difference in the sum; the sum will always be that number.

Key: **3.** 4; 4. **4.**

12	7	5	0
7			7
5			5
0	7	5	12

5.

8	12	9	13
17			17
4			4
13	12	9	8

6.

5	9	11	15
6			6
14			14
15	9	11	5

Page 85

Aim: To teach the zero subtraction facts

Suggestion: Use an approach similar to that for the zero addition facts. Allow the pupils to make their own generalization before opening their books and doing the work.

Key: **2.** No cents, zero. **3.** Four, 4. **4.** 0, 2, 5, 0, 6, 0, 3, 9. **5.** 0, 0, 0, 7, 0, 8, 0, 4.

Page 86

Aim: To review the work in addition and subtraction of 2-figure numbers taught in Chapter 2

Key: **1.** 45¢ + 30¢ = 75¢. **2.** \$35 + \$20 = \$55. **3.** 139, 123, 156, 156, 124, 148, 134. **4.** 177, 148, 145, 169, 137, 119, 154. **5.** 13, 12. **6.** 14, 15. **7.** 128 pictures − 40 pictures = 88 pictures. **8.** 144 sheets − 80 sheets = 64 sheets. **9.** 89, 33, 95, 80, 63, 83. **10.** 80, 21, 57, 83, 44, 87.

Page 87

Aim: To provide an opportunity to prove mastery of the 100 basic addition facts

Suggestion: Watch carefully the work habits of the pupils. Those who hesitate on certain items should be encouraged to place a check mark on the paper so that further attention can be given those facts not fully mastered.

Key: **1.** 9, 8, 10, 5, 7, 8, 9, 3, 9, 6. **2.** 8, 8, 2, 15, 9, 10, 4, 11, 6, 1. **3.** 7, 12, 10, 6, 6, 8, 17, 4, 10, 16. **4.** 5, 5, 16, 9, 7, 16, 8, 4, 5, 13. **5.** 11, 9, 4, 15, 11, 7, 7, 11, 6, 10. **6.** 11, 1, 12, 13, 0, 10, 14, 5, 5, 18. **7.** 9, 12, 8, 10, 11, 11, 3, 12, 17, 9. **8.** 6, 7, 13, 6, 15, 2, 14, 7, 12, 9. **9.** 9, 14, 8, 14, 11, 10, 13, 8, 7, 3. **10.** 12, 2, 13, 10, 13, 15, 3, 12, 4, 14.

Page 88

Aim: To provide a test on the 100 subtraction facts

Suggestion: Follow the plan suggested for page 87.

Key: **1.** 4, 0, 3, 3, 4, 3, 8, 3, 6, 7. **2.** 7, 1, 2, 0, 3, 2, 6, 9, 7, 5. **3.** 1, 3, 2, 2, 0, 9, 8, 1, 6, 8. **4.** 2, 0, 7, 3, 1, 6, 7, 8, 9, 9. **5.** 2, 5, 6, 1, 0, 6, 4, 4, 5, 5. **6.** 1, 6, 0, 1, 7, 9, 7, 8, 8, 6. **7.** 4, 0, 1, 4, 1, 2, 9, 3, 9, 7. **8.** 2, 2, 5, 5, 5, 9, 4, 4, 5, 6. **9.** 0, 4, 8, 3, 1, 8, 7, 7, 2, 8. **10.** 4, 0, 5, 8, 0, 9, 6, 5, 9, 3.

Page 89

Aim: To teach a new thought pattern in subtraction — "finding one of the parts"

Suggestion: Provide situations similar to those suggested in the text. Use everyday classroom situations and help the pupils to realize that finding one of the parts on this page is like finding a missing addend on page 47.

Key: **1.** 3 boy dolls; yes. **2.** 10 − 2 = 8 (white pigs). **3.** 18 − 9 = 9 (nut cookies). **4.** 25 − 12 = 13 (boys). **5.** 15 − 6 = 9 (blue flowers). **6.** 30 − 10 = 20 (white hens). **7.** 25¢ − 15¢ = 10¢.

Page 90

Aim: To review some of the major aims of Chapter 2

Suggestions: In terms of the aims listed at the beginning of this chapter, the items in this test are developed as follows:

Chapter Review	*Aim Number*
Ex. 1–2	1
Ex. 3–4	7
Ex. 5–6	4
Ex. 7–9, 12–13	2 and 3
Ex. 10–11	5 and 9

Aims 6 and 8 are tested on the next page.

Key: **1.** 5, 5. **2.** 3, 3. **3.** 50¢. **4.** 24¢. **5.** 3, 7, 4. **6.** 6, 0, 5. **7.** 14, 11, 14, 13, 12, 11, 13, 12. **8.** 149, 178, 168, 135, 129, 116, 155, 137. **9.** 54. **10.** 118 bags − 45 bags = 73 bags. **11.** 115 − 72 = 43 (bird pictures). **12.** 22, 18, 40, 86, 45, 73, 83. **13.** 25, 11, 26, 90, 43, 87, 82.

Page 91

Aim: To present Problem Test 2

Suggestion: Assign a good reader to work with anyone having difficulty in reading these simple word problems. The purpose of this test is to determine the ability of the pupil to solve problems — not to read them. The vocabulary taught in this chapter is included in these problems, together with the concepts and thought patterns developed in Chapter 2.

Key: **1.** 12 dolls − 4 dolls = 8 dolls. **2.** 178 stamps − 95 stamps = 83 stamps. **3.** 50¢ + 25¢ = 75¢; yes. **4.** 12 − 3 = 9 (small planes). **5.** 6 + 3 + 6 = 15 (animals). **6.** $9 + $6 = $15. **7.** $9 − $7 = $2. **8.** 43 children + 46 children = 89 children. **9.** 35 children − 24 children = 11 children. **10.** 12 cakes − 5 cakes = 7 cakes.

Page 92

Aims: To provide a diagnostic test of addition and subtraction skills; to recommend further practice exercises

Suggestions: All the addition and subtraction skills taught in this chapter are found here. Pupils who miss more than one example in a row are urged to turn back to a practice page for further work before starting Chapter 3. Urge the pupils to accept this responsibility without direct teacher supervision.

Key: **1.** 16, 11, 17, 14, 15, 13, 18. **2.** 16, 12, 12, 15, 13, 11, 14. **3.** 12, 11, 14, 13, 14, 11, 12. **4.** 107, 189, 128, 168, 129, 132. **5.** 9, 6, 7, 9, 7, 5. **6.** 3, 6, 9, 7, 8, 9. **7.** 54, 76, 87, 83, 61. **8.** 26, 72, 93, 91, 52. **9.** 85, 73, 50, 82, 84.

Chapter 3

Aims of Chapter 3. The major aims of Chapter 3 are to:

1. Maintain skills of addition, subtraction, and problem solving taught in the previous chapters.
2. Extend place value understandings through the thousands.
3. Teach the addition and subtraction of 3-figure numbers.
4. Teach adding by endings.
5. Reteach the fractional concepts of halves, thirds, and fourths and to teach how to write these concepts in figures.
6. Provide experiences in reading the clock and the calendar.
7. Enlarge the pupils' vocabulary in arithmetic with particular attention to addition thought patterns.
8. Teach new process steps in subtracting with gaps and vanishing lefts.

Pages 93–94

Aim: To extend place value understanding through the thousands

Suggestions: Notice that the first problem on page 93 deals with sheets of stamps. The development of the thousands concept with sticks or other manipulative objects is unwieldy and difficult. Also, the contrast of a $10.00 bill with a $1.00 bill is not always clear. Sheets of stamps can be more easily handled. At this point the pupil is again reminded of the tens nature of our number system. Constant discussion and repetition of the tens concept is vital to the learning of place value and the tens nature of our system.

Page 94 shifts the thinking of the pupil to various ways of expressing 4-figure numbers in words. Notice the multiplicity of ways the number 1036 in ex. 3 can be read:

a. one thousand thirty-six
b. ten hundred thirty-six
c. ten thirty-six

At this point, take ample time to raise such questions about the meaning of 1036 as:

a. How many thousands are there in this number?
b. How many hundreds are there in the entire number?
c. How many tens are there in the entire number?
d. How many ones are there in the entire number?

Some children may respond by naming the figure in each of the respective places, in which case they have not properly learned place value. There are *not* "0 hundreds" in the entire number; there are "10 hundreds" in the entire number. There are *not* "3 tens" in the entire number; there are "103 tens" in the entire number. There are *not* "6 ones" in the entire number; there are "1036 ones" in the entire number. Contrast this idea with the recognizable fact that there is a "0 figure" in the hundreds place, a "3 figure" in the tens place, and a "6 figure" in the ones place. Emphasis should be placed on the fact that "0" acts as a place holder in the hundreds place of this number to hold the 1 in thousands place. Give many other illustrations of how zero acts as a place holder in other numbers. Ask the pupils to cut from newspapers and magazines numbers of like size (4-figure numbers), bring them to class, and construct a number poster. Spend ample time developing this important understanding of place value and the place-holding nature of zero.

Workbook Reference: Arithmetic Workshop, Book 3, page 36

Key: Page 93 **1.** 400, 500, 600, 700, 800, 900, 1000.

Page 94 **1.** One thousand two hundred, or twelve hundred; one thousand four hundred, or fourteen hundred; one thousand eight hundred, or eighteen hundred; one thousand three hundred, or thirteen hundred; one thousand nine hundred, or nineteen hundred. **3.** Ten hundred seven. **4.** Nineteen fifty-four (nineteen hundred fifty-four); nineteen fifty-three (nineteen hundred fifty-three); seventeen "o" eight (seventeen hundred eight). **5.** One thousand four hundred fifty-three, or fourteen hundred fifty-three, or fourteen fifty-three; one thousand seven hundred seventy-nine, or seventeen hundred seventy-nine, or seventeen seventy-nine; one thousand four, or ten hundred four; one thousand thirty-five, or ten hundred thirty-five, or ten thirty-five; one thousand six hundred sixty-one, or sixteen hundred sixty-one, or sixteen sixty-one. **6.** One thousand one, or ten hundred one; one thousand eight hundred, or eighteen hundred; one thousand five hundred ninety-six, or fifteen hundred ninety-six, or fifteen ninety-six; one thousand eight hundred thirty, or eighteen hundred thirty, or eighteen thirty; one thousand nine hundred fifty-eight, or nineteen hundred fifty-eight, or nineteen fifty-eight. **7.** 1530, 1004. **8.** 1950, 1400.

Page 95

Aim: To maintain the skills taught in Chapter 2

Suggestion: Notice that the word problems relate to the holidays. The use of holidays to stimulate interest in arithmetic is recommended. Christmas makes an ideal holiday for arithmetic instruction since so many quantitative concepts surround this season of the year. Children should be encouraged to talk about their Christmas wants and budgets. Many sound ideas on the value of money and the relationship between costs and cash on hand can be developed under the guidance of the alert teacher.

Key: **1.** 80 boxes + 75 boxes = 155 boxes. **2.** 62 toys + 93 toys = 155 toys; yes. **3.** 155 − 90 = 65 (bags). **4.** 146, 108, 119, 167, 145, 108, 189, 153. **5.** 149, 126, 117, 157, 138, 175, 118, 109. **6.** 148, 116, 179, 139, 125, 127, 129, 136. **7.** 124, 100, 109, 168, 167, 157, 118, 136.

Page 96

Aim: To teach column addition involving 3-figure numbers and two addends without carrying

Suggestions: This work extends that reviewed on page 95 and restricts the sum in the tens place to 9 or less. Have pupils discuss why they add ones to ones, tens to tens, and hundreds to hundreds. In ex. 6 and 7 there is an excellent opportunity for more advanced pupils to try mental addition. Challenge them to do the work by just looking at the numbers and writing the answers. Teachers should utilize every opportunity to improve the mental arithmetic skills of the more advanced pupil. However, other class members should be permitted, and even encouraged, to copy the numbers if the work will thereby be clearer.

Workbook Reference: Arithmetic Workshop, Grade 3, page 37

Key: **2.** 396, 859, 846, 985, 832, 599. **3.** 235, 760, 476, 999, 473, 794. **4.** 674, 489, 938, 595, 857, 814. **5.** 755, 909, 797, 823, 364, 686. **6.** 583, 796, 967, 885, 676, 784. **7.** 425, 638, 809, 727, 518, 626.

Page 97

Aim: To maintain the skill of adding a single column with 3 addends

Suggestions: Notice that the word problems in ex. 1–3 have an interesting correlation with the problems on a visit to the park presented on pages 66 and 67. Open the period by reminding the class of those problems and then begin this work. Most children will have no difficulty in doing the word problems or the column addition. Urge them to check their work by adding down.

Key: **1.** 5 balloons + 4 balloons + 5 balloons = 14 balloons. **2.** 4 balloons + 2 balloons + 3 balloons = 9 balloons. **3.** 14 balloons; 9 balloons; 14 − 9 = 5 balloons. **4.** 12, 11, 11, 14, 13, 16, 12, 12, 11. **5.** 12, 13, 11, 15, 12, 14, 15, 11, 13. **6.** 13, 11, 11, 11, 14, 13, 11, 15, 14.

Pages 98–100

Aims: To reteach the meaning of one half, one third, and one fourth; to teach the fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$; to teach the concepts *halves, thirds, fourths*

Suggestions: Begin the class period by distributing square pieces of paper. Ask the pupils to color one half of the paper red. Explain that there is a way of writing one half and show the fraction $\frac{1}{2}$. Instruct the pupils to write $\frac{1}{2}$ on the colored part of their paper. Now ask the class to count the number of *halves* in this piece of paper. At this point, have the class open their books to page 98 and begin the exercises. The book work should be done as a class activity with ample board work illustrating further the concepts *one half* and *halves*. Whenever the term *one half* is used, suggest that the pupils write it. Now repeat the process for the fraction $\frac{1}{3}$, using ex. 1–2 on page 99, and again for the fraction $\frac{1}{4}$, using ex. 3–6. All fractions used on these pages refer to a single object. You will wisely center the class discussion on this phase of fraction work and leave until

Grade 4 any reference to $\frac{1}{2}$ of a group of objects (*i.e.*, $\frac{1}{2}$ of 6, $\frac{1}{2}$ of 10). Also, do not extend the discussion or class activity to finding $\frac{2}{3}$ or $\frac{3}{4}$ of an object at this time, as all fraction work on these pages is restricted to the unit fraction.

There are many ways of enriching this discussion of fractions. Excellent flannel boards with flannel fractional parts are sold by school supply companies, and pupils may cut from newspapers pictures illustrating $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$ of an object. If a boy enjoys working with a saw and hammer, he might bring to class four pieces of thin wood of equal length. He should keep one piece as the whole piece, cut the second piece in half, the third in fourths, and the final piece in thirds. (You may need to assist in determining accurate measurements.) Then exhibit to the class the whole piece, a half piece, a one-third piece, and a one-fourth piece. Another visual aid can be constructed from cardboard. Cut out 4 circles, all having the same diameter. Keep one circle intact and color it a heavy solid color (red, brown, black). Cut one circle in half, cut out $\frac{1}{3}$ of another, cut $\frac{1}{4}$ out of the last one. Place the whole circle behind any of the cut circles; the contrast reveals the fractional part. Label the half circle $\frac{1}{2}$, the second circle $\frac{1}{3}$, and so on.

Key: Page 98 **3.** Two; two; two; two. **4.** Yes; yes; the two parts are not equal.

Page 99 **1.** 3 thirds. **2.** The cake and the peppermint stick. **3.** 4 fourths. **4.** 3 thirds; 4 fourths. **6.** Top left; lower left, lower right.

Page 100 **1.** A, $\frac{1}{2}$; B, $\frac{1}{3}$; C, $\frac{1}{4}$; D, $\frac{1}{3}$; E, $\frac{1}{4}$; F, $\frac{1}{2}$; G, $\frac{1}{4}$; H, $\frac{1}{2}$. **2.** The fourth; the second; the first; the third. **5.** 2 halves; 2 halves. **6.** 4 fourths; 4 fourths.

Page 101

Aim: To maintain the subtraction skills taught in Chapter 2

Suggestion: Have the pupils work ex. 1–3 orally.

Key: **1.** 5, 7, 9, 7, 8, 5, 9, 4. **2.** 6, 6, 8, 9, 6, 7, 9, 3. **3.** 3, 3, 7, 9, 2, 5, 6, 8. **4.** 144 eggs − 60 eggs = 84 eggs. **5.** \$128 − \$83 = \$45. **6.** 156 − 94 = 62. **7.** 127 − 82 = 45. **8.** 31, 13, 15, 41, 96, 50, 94. **9.** 20, 48, 13, 43, 90, 86, 92. **10.** 30, 20, 14, 75, 53, 64, 82. **11.** 56, 32, 40, 50, 85, 64, 74. **12.** 52, 29, 70, 91, 81, 87, 74.

Page 102

Aim: To present word problems dealing with both addition and subtraction thought patterns

Suggestion: This page of problems is similar in nature to the problems on page 51. Be certain that pupils can explain *why* they add or *why* they subtract. Be sure they understand the meaning of "how many more" and "how many in all."

Workbook Reference: Arithmetic Workshop, Grade 3, page 39

Key: **1.** Subtract; 125 tickets − 70 tickets = 55 tickets. **2.** Add; 73 beads + 41 beads = 114 beads. **3.** Add; 38¢ + 50¢ = 88¢. **4.** Subtract; 125 − 61 = 64 (boys). **5.** Add; 85 cars + 34 cars = 119 cars. **6.** Add; 65 cards + 70 cards = 135 cards. **7.** Subtract; 135 cards (ex. 6) − 40 cards = 95 cards. **8.** Subtract; 40 cards need 40 stamps; 40 − 30 = 10 (stamps).

Page 103

Aim: To extend subtraction to 3-figure numbers without regrouping

Suggestions: In explaining the model example in ex. 1, you might first write on the board the number 655 as 6 hundreds, 5 tens, 5 ones, and the number 423 as 4 hundreds, 2 tens, 3 ones, setting them down in the subtraction form shown at the right. Then explain the steps according to the method of subtraction being taught. After working the example in this form, write the numbers in abstract form, as shown in the model example, and subtract.

6 hundreds	5 tens	5 ones
4 hundreds	2 tens	3 ones

Workbook Reference: Arithmetic Workshop, Book 3, page 38

Key: **2.** 412, 123, 552, 133, 361, 231. **3.** 126, 762, 123, 434, 133, 551. **4.** 215, 164, 614, 315, 407, 241.

Page 104

Aim: To teach new steps in subtraction

Suggestions: The problem at the top of the page shows a subtraction example which has a vanishing left (nothing remains in the tens place after the subtraction). Many pupils will place a 0 in the tens place of the remainder. Notice how the text explains the needlessness of the 0. This is another lesson in place value and in the use of zero as a place holder. If some children do not readily understand why the 0 *is not needed as a place holder*, write on the board numbers such as the following and ask the pupils to read them:

05 09 014 068

After your explanation, the pupils will follow the reasoning that *no place is being held* in this case. However, ample drill here insures sound teaching of this idea. A count of the practice examples on this page will reveal twenty such examples.

Another minor process step included on this page is the "gap." Notice the second example in ex. 2. The subtrahend is a 1-figure number, while the minuend is a 2-figure number. The pupil is led to realize that as there is nothing (expressed or unexpressed) to subtract in the tens place, he must "bring down" the figure in the tens place of the minuend to the remainder. Naturally, with the class you are not using the terms *minuend, subtrahend,* and *remainder;* but you are giving careful attention to an understanding of this process step. Once again *place value* becomes the pivotal learning. A pupil who understands that he subtracts ones from ones, tens from tens, and so on will have little difficulty. If, however, this learning is not complete, the pupil may be tempted to subtract the 4 from the 6 and the 4 from the 9 in the example under discussion. Therefore, keep emphasizing place value; and if you feel that page 104 does not have sufficient exercise material, present more examples of the same type.

Key: **4.** 5, 9, 4, 2. **5.** 5, 5, 3, 4. **6.** 22, 4, 231, 191, 8, 423. **7.** 7, 7, 5, 236, 7, 701.

Page 105

Aim: To develop an awareness of what money will buy

Suggestions: A first glance at this page might give the impression that it has been designed as another exercise in subtraction. However, much more than simple subtraction is involved. Here the child is faced with the problem, "Have I enough money to buy —?" This is an everyday question facing all of us. Urge the pupils to determine whether their money is sufficient to buy —; if it isn't, how much more is needed? Notice the atmosphere in these word problems, anyone of which could easily be related to a Christmas shopping trip.

Key: **1.** No. **2.** Yes. **3.** Yes. **4.** Yes. **5.** Yes. **6.** Yes. **7.** Yes.

Pages 106–107

Aim: To teach the telling of time to the hour, half hour, quarter hour, and five-minute intervals

Suggestions: Give oral exercises in telling time by using a cardboard clock face with movable hands, one large enough for all the class to see plainly. Make a statement concerning a certain time, such as "School is out at a quarter after 3" and have a pupil fix the hands on the clock face to show that time. Also, write on the board 8:15, 7:30, 9:15, and so on, and ask certain pupils to show these times by fixing the hands on the clock in the proper positions.

Many teachers will have pupils construct clocks out of paper plates (during the art class) and color them to show "past" and "before" the hour. These pupil-constructed clocks then may be used to illustrate the time the pupil: gets up in the morning, goes to school, eats lunch, gets out of school, eats supper, goes to bed, and so on. Later, when telling time to the even five minutes is taught, these clocks may be again used. It is suggested that Arabic numerals rather than Roman numerals be used on the clock faces.

Workbook Reference: Arithmetic Workshop, Grade 3, page 11

Key: Page 106 **3.** 3 o'clock; 8 o'clock; 6 o'clock; 9 o'clock. **5.** Half past 2; half past 10; half past 3; half past 9. **6.** Long hand at 6, short hand between 1 and 2; long hand at 6, short hand between 7 and 8; long hand at 6, short hand between 4 and 5; long hand at 6, short hand between 12 and 1.

Page 107 **2.** 5 minutes; 5 minutes; 5 minutes; 15 minutes; 20 minutes; 45 minutes. **4.** 30 minutes make a half hour; 60 minutes make an hour; 25; 40; 55. **5.** 25 minutes past 3; 40 minutes past 10; 35 minutes past 12; 25 minutes to 1.

Pages 108–109

Aim: To provide experiences in reading and understanding the calendar

Suggestions: On page 108 emphasis is placed on knowing and using the days of the week. Pupils at this level enjoy stories of a fanciful nature, and some teachers may want to tell the story of how the days of the week got their names. Be prepared for such questions as:

Why are there seven days in a week?
Where did the days get their names?
Why do some months have more days than others?
Why has February only twenty-eight days?

These stories are told in thrilling and fanciful form by the teacher who senses the dramatic in this activity (see B. R. Buckingham, *Elementary Arithmetic*, pages 689–694, Boston, Ginn and Company, 1953). Page 109 extends this activity to include the months of the year. Here again an interesting story unfolds when one realizes that for many centuries March was the first month. This explains why the months of September, October, November, and December, which are now the 9th, 10th, 11th, and 12th months, were originally named September (seventh), October (eighth), November (ninth), and December (tenth).

Also, teachers will enjoy telling the story of the seasons. In those parts of the country in which the seasons are not clearly marked by weather changes, the story of the sun and its place in the heavens (equinox) will explain to children why the year is so divided (even though they can note no appreciable change in the weather). In fact, the alert teacher will keep this story of the calendar before the class for the entire year. Each month a new calendar will appear on the chalkboard. Pupils will make daily weather observations and reports, and artistically inclined children should be encouraged to create a picture above the classroom calendar.

Key: Page 108 **1.** 31 days. **2.** 7 days. **3.** Sunday; Monday; Saturday. **4.** Monday; Friday. **6.** Wednesday; Friday. **7.** Tuesday; Wednesday; Saturday; Christmas.

Page 109 **1.** January; February; June; December. **2.** Christmas is in December. **3.** Winter; summer; fall. **4.** Bottom, page 108; top, page 109; bottom, page 109; top, page 108.

Pages 110–111

Aims: To teach adding by endings without bridging; to provide opportunities to use this new skill in column addition

Suggestions: Adding by endings is a necessary skill which must be thoroughly understood and mastered if the pupils are to succeed in column addition. The relation of adding by endings to column addition will now be illustrated. To add a column of figures like the one at the right, begin at the bottom and add 5 and 8, which gives 13. Then add 13 and 4, which gives 17. In this addition the combination $5 + 8$ is one of the 100 fundamental addition

$$\begin{array}{r}4\\8\\\underline{5}\end{array}$$

facts, but the combination 13 + 4 is something new. Each of the 100 fundamental addition facts, like 5 + 8, represents the adding of a 1-figure number to a 1-figure number. The new combination 13 + 4, however, represents the adding of a 2-figure number to a 1-figure number. In column addition, adding *must always be done mentally.* This skill of adding *mentally* a 2-figure number to a 1-figure number is called "adding by endings," or "higher decade addition." The term "adding by endings" arises from the fact that the end figures of the addends are of basic importance in finding the sum. For example, in the exercise at the right, the sum 17 depends on the fact that the sum of the *end figures* is 7.

$$\begin{array}{r} 3 \\ 14 \\ \hline 17 \end{array}$$

Later on, the addition of longer columns of figures, like the one shown at the right, will involve the use, in rapid succession, of several combinations. For example, to add this column requires the use of the fundamental fact 5 + 8 and of the following combinations in adding by endings: 13 + 4, 17 + 3, and 20 + 4. It is apparent, therefore, that *successful work in column addition requires a mastery of the art of adding by endings.*

$$\begin{array}{r} 4 \\ 3 \\ 4 \\ 8 \\ 5 \\ \hline \end{array}$$

Workbook Reference: Arithmetic Workshop, Book 3, page 43

Key: Page 110 **1.** 5¢ + 3¢ = 8¢. **2.** 15¢ + 3¢ = 18¢; 8; 48. **3.** 25¢ + 3¢ = 28¢; 85¢ + 3¢ = 88¢. **4.** 9, 19; 9, 49; 7, 67; 8, 28. **5.** 16, 56, 26, 76. **6.** 17, 87, 47, 37. **7.** 19, 39, 69, 99. **8.** 26, 96, 56, 46. **9.** 37, 67, 17, 57. **10.** 58, 29, 78, 49, 37, 87, 59, 99. **11.** 89, 59, 38, 79, 19, 28, 97, 86. **12.** 19, 68, 27, 47, 66, 48, 57, 29. Page 111 **1.** 19, 58, 26, 59. **2.** 29, 19, 69, 29. **3.** 49, 17, 18, 94. **4.** 65, 18, 58, 75. **5.** 59, 69, 78, 29. **6.** 87, 18, 27, 39. **7.** 14 marbles + 5 marbles = 19 marbles. **8.** 15¢ + 3¢ = 18¢. **9.** 12¢ + 3¢ = 15¢. **10.** 13¢ + 4¢ = 17¢. **11.** 10 books + 6 books = 16 books. **12.** 46, 86, 36, 96, 24, 54, 84, 64. **13.** 42, 82, 22, 52, 17, 77, 27, 47. **14.** 35, 95, 55, 85, 33, 73, 53, 13. **15.** 66, 44, 87, 25, 83, 91, 72, 23. **16.** Adding 2: 47, 87, 37, 97, 25, 55, 85, 65; 43, 83, 23, 53, 18, 78, 28, 48; 36, 96, 56, 86, 34, 74, 54, 14; 67, 45, 88, 26, 84, 92, 73, 24; adding 3, 48, 88, 38, 98, 26, 56, 86, 66; 44, 84, 24, 54, 19, 79, 29, 49; 37, 97, 57, 87, 35, 75, 55, 15; 68, 46, 89, 27, 85, 93, 74, 25.

Page 112

Aim: To provide experience in adding by endings in word problems and examples

Suggestion: Here the pupil will encounter adding by endings both in upward adding (to secure the answer) and in downward adding (to check the answer). It is obvious that a different set of addition facts is encountered in the checking process. Encourage the children to do this work orally; and if you find that certain pupils have not mastered the skill, make special provision for further practice. You might construct a whole series of adding-by-endings cards arranged in two groups:

1. A set in which no bridging takes place
2. A set where bridging takes place

The work on pages 110–112 is of the first variety. *To bridge* means that the new sum is in a different decade from the original 2-figure addend; *i.e.*,

$$10 + 6 = 16 \text{ (no bridging)}$$
$$15 + 6 = 21 \text{ (bridging)}$$

Workbook Reference: Arithmetic Workshop, Book 3, page 45

Key: **2.** 9¢ + 2¢ + 5¢ = 16¢. **3.** 7 eggs + 5 eggs + 3 eggs = 15 eggs. **4.** 17, 19, 16, 19, 18, 14, 16, 16, 19. **5.** 19, 19, 19, 19, 14, 17, 19, 19, 17. **6.** 17, 19, 19, 16, 18, 17, 18, 16, 15.

Page 113

Aim: To provide further experience with one-step word problems

Suggestions: Children who live in the northern part of the United States will have many experiences to relate prior to working these problems. However, those living in states where snow is rarely seen will need special motivation. A motion picture showing children in snow country or stories told by pupils who have been in the mountains in the winter will help set the stage for this problem work. When interest is high, suggest that the class open their books to page 113 and begin the word problems.

Workbook Reference: Arithmetic Workshop, Book 3, page 46

Key: **1.** 50¢ + 45¢ = 95¢. **2.** 1 hour and 30 minutes, or $1\frac{1}{2}$ hours. **3.** 5 snowballs + 3 snowballs + 6 snowballs = 14 snowballs. **4.** 4 snowballs + 5 snowballs + 3 snowballs = 12 snowballs. **5.** 7 + 8 = 15 (snowballs). **6.** 98¢ − 75¢ = 23¢. **7.** 15 children − 9 children = 6 children.

Page 114

Aim: To provide an oral review

Workbook Reference: Arithmetic Workshop, Book 3, page 42

Key: **1.** 16, 38, 29, 8. **2.** 6, 48, 17, 18. **3.** 27, 6, 58, 7. **4.** 9, 29, 3, 49. **5.** One half; one fourth; one fourth; one third. **6.** 10. **7.** 2; 10. **8.** 4. **9.** 507; 960. **11.** 45 minutes past 12; 15 minutes past 6; half past 9; 25 minutes past 11. **12.** 8, 9, 6, 8, 10, 9, 9, 9, 10.

Page 115

Aims: To present a completion test; to review arithmetic terms used in the chapter

Suggestions: Have the work in ex. 1–4 completed orally. The completion test in ex. 5–11 may be new in form to many pupils. The work should first be done orally, and then the answers should be written on a piece of paper. Avoid requesting the class to copy the sentences. Again remind the children not to write in their books.

Key: **1.** 14, 17, 16, 16, 14, 17, 11, 11, 11. **2.** 12, 16, 11, 14, 18, 19, 14, 13, 15. **3.** 14, 13, 16, 15, 16, 12, 15, 14, 18. **4.** 15, 12, 16, 13, 15, 19, 13, 19, 18. **5.** Half. **6.** Tens, ones. **7.** Tens, ones. **8.** Cent. **9.** Subtracting. **10.** Adding. **11.** Sum.

Page 116

Aim: To teach the addition thought patterns *both, all, in all, all together*

Suggestions: These thought patterns are well known to most children and will require little explanation or enrichment. However, the technical vocabulary words *sum* and *addition* may need more attention.

Key: **1.** 12 tickets + 15 tickets = 27 tickets. **2.** 5¢ + 7¢ + 7¢ = 19¢. **3.** 6 roses + 8 roses + 4 roses = 18 roses. **4.** 40¢ + 25¢ = 65¢. **5.** 33 children + 35 children = 68 children. **6.** 6 cakes + 6 cakes + 4 cakes = 16 cakes.

Page 117

Aim: To prepare for the chapter test

Workbook Reference: Arithmetic Workshop, Book 3, pages 47 and 48

Key: **1.** 12, 13, 17, 16, 17, 15, 10, 10, 14. **2.** 95, 112, 59, 76, 584, 698, 469. **3.** 147, 65, 168, 65, 997, 689, 874. **4.** 16, 37, 65, 94, 49, 18, 24, 77. **5.** Adding 2: 14, 35, 63, 92, 47, 16, 22, 75; adding 3: 15, 36, 64, 93, 48, 17, 23, 76. **6.** 260, 270, 280, 290, 300. **7.** 300, 400, 500, 600, 700, 800, 900, 1000. **8.** 63, 76, 2, 46, 400, 401, 501. **9.** 33, 12, 25, 31, 91, 81, 95. **10.** 433; 229. **11.** 45; 124. **12.** 610, 1500. **13.** 950, 291.

Page 118

Aim: To review some of the major aims of Chapter 3

Suggestion: The work on this page reviews six of the aims listed at the beginning of this chapter, as follows:

Chapter Review	*Aim Number*
Ex. 1–2	2
Ex. 3	5
Ex. 4–9	1
Ex. 10–13	4
Ex. 14–15	3 and 8

Aim 6, dealing with the clock and the calendar, is not reviewed at this time; aim 7 is thoroughly evaluated in the Problem Test that follows.

Key: **1.** 436. **2.** 1285. **3.** $\frac{1}{2}$, $\frac{1}{4}$. **4.** 40¢. **5.** 60¢. **6.** 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109; 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229. **7.** 70, 80, 90, 100, 110; 650, 660, 670, 680, 690. **8.** 125, 130, 135, 140, 145, 150, 155, 160; 300, 305, 310, 315, 320, 325, 330. **9.** 1400, 1500, 1600, 1700, 1800, 1900. **10.** 18, 87, 46, 85, 39, 67. **11.** 25, 47, 39, 96, 62, 88. **12.** 18, 15, 19, 19, 17, 19, 14, 18, 15. **13.** 14, 19, 19, 17, 14, 19, 17, 18, 19. **14.** 89, 79, 77, 170, 169, 696, 576. **15.** 8, 45, 30, 41, 94, 222, 230.

Page 119

Aim: To present Problem Test 3

Suggestion: The addition and subtraction thought patterns developed to this point are thoroughly evaluated in this test. All problems are one-step problems dealing with experiences common to third-grade children.

Key: **1.** 12 fish − 7 fish = 5 fish. **2.** 7 leaves + 6 leaves + 5 leaves = 18 leaves. **3.** 35 − 20 = 15 (boys). **4.** 75¢ − 50¢ = 25¢. **5.** 50¢ + 40¢ = 90¢. **6.** 250 cards − 110 cards = 140 cards. **7.** 50¢ − 30¢ = 20¢. **8.** 90 buttons + 45 buttons = 135 buttons. **9.** 8 + 9 + 2 = 19 (people). **10.** 275 stamps − 150 stamps = 125 stamps.

Page 120

Aims: To provide a diagnostic test of the skills taught and reviewed to date; to suggest additional practice exercises

Suggestion: The work on this page is arranged in order of difficulty, each line being devoted to a basic skill. The pupils should make self-assignments for practice work.

Key: **1.** 89, 57, 85, 167, 117, 137. **2.** 39, 27, 49, 69, 97, 58. **3.** 889, 576, 946, 869, 846. **4.** 11, 14, 15, 12, 12, 11. **5.** 19, 17, 17, 17, 17, 17. **6.** 43, 36, 53, 31, 47, 15. **7.** 77, 96, 95, 96, 84. **8.** 221, 212, 635, 412, 142. **9.** 7, 353, 402, 5, 71.

Chapter 4

Aims of Chapter 4. The major aims of Chapter 4 are to:

1. Maintain the skills and enrich the understandings developed in previous chapters.
2. Teach adding by endings with bridging, with applications in column addition.
3. Teach carrying in addition and regrouping in subtraction in which 3-place numbers appear.
4. Teach the measures of inch, foot, and dozen.
5. Extend addition and subtraction thought patterns in problem-solving situations.

Page 121

Aim: To provide a problem-solving situation around a birthday party

Suggestions: Few things are anticipated with more enthusiasm than a birthday party. Children will be happy to talk about a recent party or an anticipated one. After pupil interest has been aroused, have the pupils open their books. Some teachers will extend this activity by encouraging the class to make up their own problems dealing with birthday parties. Such problems may be written on the board and completed as extra work.

Key: **1.** $12 + 13 = 25$ (children). **2.** 15 hats + 14 hats = 29 hats; yes. **3.** 32 pieces + 16 pieces = 48 pieces. **4.** 25 children − 10 children = 15 children.

Pages 122–123

Aim: To extend column addition to 2-figure numbers without carrying

Suggestions: In teaching column addition, it is important to form the right habits; consequently, the pupil should be taught to begin at the bottom of the column and add up. To check his work, he should begin at the top of the column and add down. Insist on the checking of all problems. When the work on page 123 is begun, observe carefully the way in which the children complete the exercises, as these differ from the ones on the preceding page. In this new work, the sum of the tens column is greater than ten. Pupils should be encouraged to discuss the fact that 16 tens is the same as 1 hundred and 6 tens, and so on.

Key: Page 122 **2.** 10¢ + 15¢ + 40¢ = 65¢. **3.** 25¢ + 30¢ + 20¢ = 75¢. **4.** 86, 98, 69, 98, 78, 87, 87, 98. **5.** 75, 89, 79, 89, 84, 98, 95, 89. **6.** 89, 99, 89, 89, 67, 98, 96, 68. **7.** 78, 96, 99, 77, 88, 99, 87, 68.

Page 123 **2.** 119, 118, 108, 107, 118, 139, 148, 148. **3.** 137, 129, 167, 119, 198, 119, 159, 139. **4.** 117, 108, 138, 148, 139, 117, 155, 146. **5.** 129, 127, 159, 109, 188, 147, 109, 136. **6.** 72 cookies + 60 cookies + 36 cookies = 168 cookies. **7.** $42 + 36 + 10 = 88$ (people).

Pages 124–125

Aim: To teach adding by endings with bridging the tens

Suggestions: In adding by endings, a combination like $16 + 3$ is much easier than a combination like $16 + 5$. In the case of $16 + 3$, the sum is still in the teens; but in the case of $16 + 5$, the sum moves up to the twenties, thus passing to the next decade. This step is often called "bridging the tens." Much more practice will be needed on those combinations which "bridge the tens" than on those which do not.

There are two ways of explaining logically why the tens figure changes in adding such numbers as 16 and 8. One way is to add the 6 ones and the 8 ones, and then regroup the resulting 14 ones as 1 ten and 4 ones. The tens are then added, producing 2 tens and 4 ones or 24 in all. This is the method commonly referred to as "carrying" in addition. The authors prefer not to use this method in explaining adding by endings with bridging since the latter is strictly a mental operation encountered in adding a column of figures, or later in carrying in multiplication. Carrying in addition is not taught in the text until examples such as $29 + 38$ are presented, requiring written computation. Rather, the recommended approach used here is to teach the pupil to intuitively build on to a number until a multiple of ten is reached and then add the required amount to this number. Ex. 2 on page 124 shows the child how to do this. Parentheses may be inserted if desired to stress how the numbers may be associated differently as follows: $16 + 8 = 16 + (4 + 4) = (16 + 4) + 4 = 20 + 4 = 24$. After a little practice of this sort the pupil should be able to add in this fashion with ease. Learning how to add this way is most helpful in other mental arithmetic situations. As pointed out previously, the *associative principle of addition* allows us to change the grouping of the addends with the guarantee that the sum will not be changed.

After pupils have acquired the necessary understanding of bridging a ten they should be urged to speed up the process by concentrating on the ending, remembering to increase the tens figure by 1 when a ten is bridged. The exercises on these pages should be solved mentally. Intensive practice on adding by endings will be richly rewarded when the work in column addition is encountered on the next two pages.

Key: Page 124 **1.** 6¢ + 8¢ = 14¢. **2.** 16¢ + 8¢ = 24¢. **5.** 13, 33, 63, 73, 12, 42, 82, 52. **6.** 15, 55, 25, 75, 11, 41, 91, 31.

Page 125 **1.** 40, 60, 71, 81, 31, 91, 25, 55. **2.** 46, 76, 33, 53, 51, 91, 82, 62. **3.** 26, 56, 33, 63, 73, 93, 32, 42. **4.** 52, 72, 60, 80, 22, 62, 70, 80. **5.** 33, 43, 63, 93. **6.** 22, 32, 52, 82. **7.** 42, 92, 32, 52. **8.** **Adding 4:** 35, 85, 25, 55, 18, 38, 68, 78. **9.** 84, 64, 54, 24, 79, 19, 39, 69. **10.** 76, 16, 56, 36, 22, 52, 32, 82. **11.** 60, 30, 90, 50, 53, 33, 23, 93. **12.** 21, 51, 71, 61, 87, 67, 47, 17. **13.** 42, 92, 62, 72, 20, 80, 40, 70. **14.** 48, 77, 31, 43, 49, 66, 44, 75. **Adding 5:** 8. 36, 86, 26, 56, 19, 39, 69, 79. 9. 85, 65, 55, 25, 80, 20, 40, 70. 10. 77, 17, 57, 37, 23, 53, 33, 83. 11. 61, 31, 91, 51, 54, 34, 24, 94. 12. 22, 52, 72, 62, 88, 68, 48, 18. 13. 43, 93, 63, 73, 21, 81, 41, 71. **14.** 49, 78, 32, 44, 50, 67, 45, 76. **Adding 8, 6, 7, 9, 3 in turn:** **8.** 39, 37, 38, 40, 34; 89, 87, 88, 90, 84; 29, 27, 28, 30, 24; 59, 57, 58, 60, 54; 22, 20, 21, 23, 17; 42, 40, 41, 43, 37; 72, 70, 71, 73, 67; 82, 80, 81, 83, 77. **9.** 88, 86, 87, 89, 83; 68, 66, 67, 69, 63; 58, 56, 57, 59, 53; 28, 26, 27, 29, 23; 83, 81, 82, 84, 78; 23, 21, 22, 24, 18; 43, 41, 42, 44, 38; 73, 71, 72, 74, 68. **10.** 80, 78, 79, 81, 75; 20, 18, 19, 21, 15; 60, 58, 59, 61, 55; 40, 38, 39, 41, 35; 26, 24, 25, 27, 21; 56, 54, 55, 57, 51; 36, 34, 35, 37, 31; 86, 84, 85, 87, 81. **11.** 64, 62, 63, 65, 59; 34, 32, 33, 35, 29; 94, 92, 93, 95, 89; 54, 52, 53, 55, 49; 57, 55, 56, 58, 52; 37, 35, 36, 38, 32; 27, 25, 26, 28, 22; 97, 95, 96, 98, 92. **12.** 25, 23, 24, 26, 20; 55, 53, 54, 56, 50; 75, 73, 74, 76, 70; 65, 63, 64, 66, 60; 91, 89, 90, 92, 86; 71, 69, 70, 72, 66; 51, 49, 50, 52, 46; 21, 19, 20, 22, 16. **13.** 46, 44, 45, 47, 21; 96, 94, 95, 97, 91; 66, 64, 65, 67, 61; 76, 74, 75, 77, 71; 24, 22, 23, 25, 19; 84, 82, 83, 85, 79; 44, 42, 43, 45, 39; 74, 72, 73, 75, 69. **14.** 52, 50, 51, 53, 47; 81, 79, 80, 82, 76; 35, 33, 34, 36, 30; 47, 45, 46, 48, 42; 53, 51, 52, 54, 48; 70, 68, 69, 71, 65; 48, 46, 47, 49, 43; 79, 77, 78, 80, 74.

Page 126

Aim: To introduce column addition in which the adding by endings involves bridging the tens

Suggestions: Study carefully the explanation given in ex. 1 on page 126. In column addition, the pupils should be taught to avoid all unnecessary words. For example, in adding the column at the right, the pupil should say only "7, 11, 19, 24." Do not permit him to say, "7 and 4 are 11, 11 and 8 are 19, 19 and 5 are 24." Rapid addition requires rapid thinking. *Rapid thinking requires the omission of all unnecessary words.*

$$\begin{array}{r}5\\8\\4\\\underline{7}\end{array}$$

Key: **2.** 5 + 7 + 6 + 5 = 23. **3.** 22, 21, 13, 22, 23, 22, 20. **4.** 22, 23, 22, 20, 20, 18, 24, 21, 23. **5.** 25, 18, 21, 21, 24. **6.** 17, 20, 22, 23, 18.

Page 127

Aim: To review subtraction of 3-figure numbers without regrouping

Suggestions: Urge the pupils to do mentally the examples in ex. 4–6. This procedure may be extended to ex. 11–14 for the rapid learner. The slower pupil, however, should be encouraged to discuss the examples as, "7 ones from 9 ones are 2 ones. Write the 2 ones. Now 1 ten from 6 tens is 5 tens. Write the 5 tens." Continue this plan for ex. 11–14, which provide experiences in subtracting hundreds from hundreds.

Workbook Reference: Arithmetic Workshop, Book 3, page 55

Key: **1.** \$250 − \$140 = \$110. **2.** \$588 − \$342 = \$246. **3.** 165 flowers − 144 flowers = 21 flowers. **4.** 52, 13, 87, 81, 76, 90. **5.** 21, 55, 42, 72, 92, 74. **6.** 46, 11, 56, 94, 90, 91. **7.** 88 − 52 = 36. **8.** 96 − 65 = 31. **9.** 39 − 15 = 24. **10.** 58 − 17 = 41. **11.** 30, 13, 233, 140, 304, 259. **12.** 21, 27, 122, 414, 814, 330. **13.** 60, 47, 722, 385, 131, 170. **14.** 80, 36, 404, 233, 566, 555.

Pages 128–129

Aim: To enrich an important concept in subtraction by introducing a greater variety of language

Suggestions: Provide ample opportunity for pupil participation in items 1 and 2 on page 128. A slow reader should be assigned a good reader as his partner. The words relating to subtraction are common to children of this age and will be readily understood. Ask the pupils to read the words in each problem which tell them they must subtract.

Key: Page 128 **4.** 10 marbles − 2 marbles = 8 marbles. **5.** 6 cookies − 2 cookies = 4 cookies. **6.** 8 bird houses − 6 bird houses = 2 bird houses. **7.** 24 cookies − 10 cookies = 14 cookies. **8.** 36 balls − 3 balls = 33 balls. **9.** 60 sheets − 40 sheets = 20 sheets.

Page 129 **10.** 9 rabbits − 2 rabbits = 7 rabbits. **11.** 12 pieces − 8 pieces = 4 pieces. **12.** 4 glasses − 3 glasses = 1 glass. **13.** 24 cups − 10 cups = 14 cups. **14.** 16 birds − 9 birds = 7 birds. **15.** 28 flowers − 12 flowers = 16 flowers.

Pages 130–131

Aim: To provide problem situations involving adding by endings

Suggestions: Observe carefully those pupils who have not acquired sufficient mastery of the skill of adding by endings. Special practice work may prove helpful. Stress the relationships which exist between the basic facts and the adding-by-endings facts, *i.e.*, $16 + 3 = 19$ is related to $6 + 3 = 9$, and so on. Ex. 7–8 on page 131 are good mental arithmetic exercises.

Key: Page 130 **1.** 6 flowers + 4 flowers + 6 flowers = 16 flowers. **2.** 6 flowers + 6 flowers + 6 flowers = 18 flowers. **3.** 8 flowers + 6 flowers + 5 flowers = 19 flowers. **4.** 6 flowers + 6 flowers + 3 flowers + 3 flowers = 18 flowers.

Page 131 **5.** 6 flowers + 6 flowers + 4 flowers + 3 flowers = 19 flowers. **6.** 72 flowers + 96 flowers = 168 flowers; 96 − 72 = 24 flowers. **7.** 17, 14, 21, 17, 22, 19, 17, 19, 21. **8.** 16, 22, 19, 15, 22, 22, 20, 20, 16.

Pages 132–133

Aim: To introduce the pupil to linear measure using only the foot and the inch

Suggestions: Each pupil should have his own ruler so that he can measure lines on the chalkboard and on paper. Do not require measurement of fractions of an inch. Show how to place the ruler at the side of the object to be measured. To teach measurement successfully, you must give the pupil actual experience in measuring, such as:

a. Measuring the length and width of his desk
b. Measuring height from the top of the desk to the floor
c. Measuring the length and width of the arithmetic book cover
d. Drawing a line 4 inches (or 6 inches or 8 inches) long

e. Approximating the length of a line and then measuring the line to check his approximation

f. Approximating the length and width of the classroom flag and then measuring it to check the approximation

Workbook Reference: Arithmetic Workshop, Book 3, page 54

Key: Page 132 **2.** 12 inches.

Page 134

Aim: To teach the meaning of *dozen*

Suggestions: Discuss various articles that are sold by the dozen and some that are not. The practice of selling things by the dozen varies in different localities. Use the practice prevalent in your city or town. For example, in many places bananas are now sold by the pound, whereas in others they are still sold by the dozen.

Key: **1.** Twelve; twelve. **2.** Twelve; yes. **3.** 12 roses + 12 roses = 24 roses, or 2 dozen roses. **4.** $12 - 6 = 6$ white roses. **5.** $12 - 4 = 8$ (red roses). **7.** 5 eggs + 5 eggs = 10 eggs; no. **8.** Cookies, oranges, pencils, flowers, rolls, buttons.

Page 135

Aim: To review pupil experiences in solving one-step problems dealing with addition and subtraction

Suggestions: This page offers a review which some of the more advanced pupils might omit. Their time could be devoted to some special work in arithmetic such as magic squares, puzzles, and so on. Many local newspapers carry *brain teasers*. Children enjoy making a scrapbook of such puzzles. This is a good time to start such a book for the arithmetic corner. As these free periods occur during the school year, advanced pupils would enjoy the scrapbook and other supplementary activities. Also, at Christmas time children may receive arithmetic games. Encourage them to share these games with the rest of the class by lending them to the class. For the slow learner, the problems on page 135 will prove interesting and challenging. The topics center around the home and the school: earning and spending money; buying school supplies; going to a school play. All of these situations are within the environment of the pupil, and little difficulty is encountered in computing the answers. If a pupil is puzzled about a problem, it is better to discuss the situation with him than to provide him with a step-by-step solution.

Workbook Reference: Arithmetic Workshop, Book 3, page 56

Key: **1.** 35¢ + 60¢ = 95¢. **2.** 20¢ + 25¢ + 10¢ = 55¢. **3.** $285 - 242 = 43$ (girls). **4.** 95¢ − 60¢ = 35¢. **5.** 31¢ + 20¢ + 18¢ = 69¢. **6.** 9¢ + 7¢ + 5¢ + 8¢ = 29¢. **7.** 120 people + 175 people = 295 people. **8.** $175 - 120 = 55$ (people). **9.** 50¢ − 40¢ = 10¢.

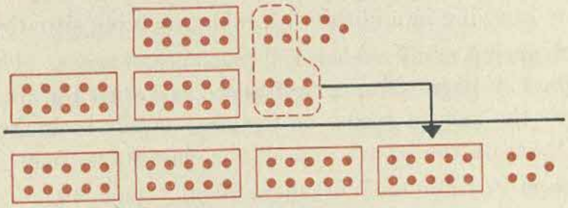
Pages 136–138

Aim: To introduce carrying in addition

Suggestions: Carrying in addition is introduced in ex. 1 on page 136 by means of a money situation. Dimes and pennies are used to illustrate the fact that 11¢ is equivalent to 1 dime and 1 cent, and that the dime secured from this exchange is added to the rest of the dimes for a total of 6 dimes. The textbook shows the pupil where this "other dime" comes from and how the 11¢ is changed to 1 dime and 1¢. The use of the large money display chart and of play money will help the class in seeing what takes place when the dime is carried to the dimes column. Have the pupils explain how to add the amounts of money in several examples, using the play money and display chart.

The transition from adding amounts of money on page 136 to adding abstract numbers on page 137 will be facilitated by having the pupils demonstrate with tongue depressors, ice cream sticks, or other suitable materials how to group 10 ones together to form a bundle of ten and add it to other bundles of ten. A good activity for seat work would be to ask the pupils to make dot diagrams to illustrate the meaning of the addition. The work below shows how this might be done in the case of the example at the top of page 137:

19 →
+ 26 → +
45 →



1 ten + 9 ones
+ 2 tens + 6 ones
3 tens + 15 ones
or
4 tens + 5 ones

Some children may profit at first by writing 1 as a helping figure above the tens column to show that 1 ten is carried. Most children should be able to add successfully without doing this, however. In keeping with modern mathematics, you may wish to provide practice in changing the sums of addition examples, such as the following:

5 tens + 16 ones = 5 tens + (? ones + 6 ones)
= (5 tens + ? ten) + 6 ones
= ? tens + 6 ones
= ?

Ex. 5–7 on page 138 are examples of the problem illustrated in ex. 4. At first inspection they would appear to necessitate changing from ones to tens and tens to hundreds. However, this is not necessary since the sum of the tens column can be written as tens. Of course, it would be wise to point out in ex. 4 that 16 tens has the same meaning as 1 hundred + 6 tens.

When the pupils understand the full meaning of the numbers being added, they are ready to shift to work involving positional values. Thus the example illustrated above by dot diagrams may be more simply represented on a place pocket chart by inserting in the top row 1 object in tens place and 9 objects in ones place. Similarly, in the second row 26 would be represented by 2 objects in tens place and 6 objects in ones place. Have the pupils demonstrate how to exchange 10 of the ones for 1 ten and insert a single object in tens place. If desired, the objects can be moved down to a bottom row on the chart to express the sum. After a little work of this kind the pupils should be ready to add on an abacus with vertical rods, where the beads in the different columns have positional or place values. An abacus having 20 beads on a rod is recommended so that the sum of $9 + 9$ can be shown prior to changing it to 1 ten + 8 ones.

Workbook Reference: Arithmetic Workshop, Book 3, pages 50, 52, and 53

Key: Page 136 **2.** 65¢, 85¢, 81¢, 90¢, 94¢, 82¢, 63¢. **3.** 46¢, 73¢, 98¢, 71¢, 74¢, 90¢, 87¢.

Page 137 **2.** $15 + 18 = 33$ (children). **3.** 76, 90, 93, 52, 93, 85, 61, 51. **4.** 80, 90, 83, 53, 78, 30, 62, 82. **5.** 56, 71, 70, 94, 82, 51, 91, 47.

Page 138 **1.** 72, 73, 85, 80, 46, 92, 54, 90. **2.** 87, 71, 41, 92, 61, 93, 63, 84. **3.** 61, 95, 63, 75, 78, 90, 80, 50. **5.** 142, 163, 140, 171, 151, 110, 185, 124. **6.** 152, 131, 196, 172, 150, 122, 112, 164. **7.** 110, 110, 145, 111, 127, 131, 143, 115.

Page 139

Aim: To illustrate carrying in addition in problem-solving situations

Suggestions: Each spring many schools sell packages of seeds. The two problem situations described on page 139 may well serve as a start for a number of problems dealing with the sale of seeds. Encourage pupils to make up their own problems, write them on the board, and let the class solve them.

Workbook Reference: Arithmetic Workshop, Book 3, page 49

Key: **2.** 18 packages + 23 packages + 25 packages = 66 packages.

Page 140

Aim: To provide further practice in carrying in addition

Suggestions: The more advanced pupil should be encouraged to do some of these examples mentally. Take the first example in ex. 1 as an illustration: "9, 13, 18. Remember the 8 and carry the 10 to the next column. 1, 4, 7, 9. The answer is 98. Now, I will check by adding down: 5, 9, 18. Remember the 8 and carry the 10. 1, 3, 6, 9. The answer 98 checks."

Key: **1.** 98, 92, 86, 94, 92, 86, 79, 98. **2.** 129, 134, 102, 126, 128, 139, 128, 108. **3.** 86, 94, 135. **4.** 97, 157, 175. **6.** 94, 82, 91, 90, 93, 127, 131, 151. **7.** 121, 131, 153, 170, 146, 133, 132, 130.

Page 141

Aim: To explore arithmetic experiences in planning a Christmas party

Suggestions: Christmas comes but once a year! No holiday provides more opportunity for teaching arithmetic than the Christmas holiday. The alert teacher will find that children will enjoy figuring their Christmas budgets and all the arithmetic problems surrounding this joyous season. The work on this page is only a starter.

Key: **1.** 19 + 20 = 39 (children). **2.** 50 stars − 30 stars = 20 stars. **3.** 25¢ + 30¢ + 25¢ = 80¢. **4.** 90¢ − 80¢ = 10¢. **5.** 48 canes + 20 canes = 68 canes. **6.** 68 canes − 40 canes = 28 canes. **7.** Yes, 1 left over.

Pages 142–143

Aim: To teach column addition of 1- and 2-place numbers

Suggestions: Problem 1 on page 142 reveals a common addition error. Jack did not know how to write in column form the example 22 + 9 + 23. If Jack had possessed a basic understanding of place value, he would have understood that the 9 represents 9¢ and that 2¢ + 9¢ + 3¢ are 14¢ (1 dime and 4¢) and that 1 dime + 2 dimes + 2 dimes are 5 dimes for a total of 5 dimes and 4¢ or 54¢. Any pupils who do not follow this reasoning should be urged to take out their play money and count out all the money involved in the addition example, thus reaching their answers objectively. The remaining problem situations found on these pages may be done in the same manner. Some pupils may need help in translating this understanding to the abstract numbers found in ex. 7 on page 143.

Key: Page 142 **1.** 3 + 9 + 2 = 14; write 4 in ones place and carry 1 to tens place; 2 + 2 + 1 = 5; write 5 in tens place. **2.** 57¢ + 25¢ + 9¢ = 91¢ paid.
Page 143 **3.** 23¢ + 19¢ + 49¢ + 6¢ = 97¢. **4.** 39¢ + 5¢ + 37¢ = 81¢. **5.** 65¢ + 8¢ + 25¢ = 98¢. **6.** 9¢ + 19¢ + 23¢ + 29¢ = 80¢. **7.** 70, 91, 86, 96, 85, 98, 80, 51.

Page 144

Aim: To provide practice in addition

Suggestion: Encourage the most advanced pupils to add the numbers in ex. 4–8 without placing them in column form. This step will require a high degree of abstract thinking and may result in the use of some rather unusual short cuts. If a pupil cannot do the work easily, allow him to place the numbers in column form according to the directions.

Key: **1.** 33 children + 29 children + 30 children = 92 children. **2.** 32 + 32 + 32 = 96 (people 3 busses can carry); 92 + 3 = 95 (people to go to the farm); 3 busses will be enough. **3.** 32 + 32 = 64 (people 2 busses can carry); 95 (ex. 2) − 7 = 88 (people); 2 busses will not be enough. **4.** 115, 187. **5.** 219, 180. **6.** 156, 226. **7.** 116, 213. **8.** 185, 139. **9.** 11 + 8 + 9 + 14 = 42; 52 + 47 + 36 = 135. **10.** 15¢ + 8¢ + 21¢ + 12¢ = 56¢. **11.** 127, 100, 95, 95, 46, 53, 118, 84. **12.** 73, 63, 43, 40, 105, 70, 57, 113.

Page 145

Aim: To provide an oral test

Suggestion: Many teachers conduct an oral test by calling on pupils in random order. This method keeps everyone alert and provides no opportunity for anyone to calculate his turn and ignore all the other answers. A pupil-teacher could conduct this test and would enjoy the experience.

Key: **1.** True. **2.** False. **3.** True. **4.** True. **5.** False. **6.** True. **7.** True. **8.** False. **9.** True. **10.** True. **11.** True. **13.** False. **14.** False. **15.** True. **16.** False. **17.** True. **18.** True. **19.** False.

Page 146

Aim: To introduce regrouping in subtraction

Suggestions: This lesson involves the inverse operation of carrying in addition. Mathematicians speak of subtraction as the *inverse* operation of addition since subtraction "undoes" what addition "does." Whereas in the addition just studied 10 ones were changed to 1 group of ten, in this lesson 1 ten is changed back to 10 ones to make the subtraction possible. In the past this operation has been commonly called "borrowing" in subtraction. However, since there is no intention to pay back what has been "borrowed," and the expression sheds no light on the mathematical nature of the operation, the expressions "change 1 ten to 10 ones" or "regroup 1 ten as 10 ones" are preferable.

Regrouping in subtraction should not be difficult for children to master provided they understand the meaning of the number system and changing in addition. The discovery approach should be used in presenting the lesson as opposed to the "teacher-telling" approach. The initial approach to regrouping in subtraction is usually most productive when dimes and pennies are used, since children comprehend money values easily. The 16 mm. film "Helping Children Discover Arithmetic" (28 minutes) produced at Wayne University, Detroit, Michigan, provides many excellent ideas for presenting this lesson by the discovery approach. Teachers and parents would profit by viewing this film.

Before having the pupils study page 146 it would be a good idea to ask them to see if they can discover how to subtract 15¢ from 32¢ using their play money. Motivate this by telling a story about a boy who had 32¢ and spent 15¢ of this money. Anticipate some rather unique solutions to a problem of this type when you allow pupils to make discoveries. For example, some children may display 32 pennies and proceed to count away 15 pennies. Do not be in a hurry. Let them discover for themselves that this is a very slow way to solve the problem. Other children may represent 32¢ with 2 dimes, 2 nickels, and 2 pennies, and then proceed to take away 1 dime and 1 nickel. Let them discover that while this is a good solution when working with coins, it is an awkward method to symbolize on paper. Have the pupils discuss their methods, demonstrate them, and symbolize them on the chalkboard. When the method presented at the top of page 146 is finally proposed, it will then be appropriate to have the pupils study this development. Strangely enough, this approach is often the one that occurs last to children. But since it is easy to symbolize and explain, it is the method the authors prefer to present in the text. In professional books this method is often referred to as the *decomposition method* of subtraction. Children will probably profit by using helping figures at first, as illustrated in the models on page 146. Do not accept an explanation in ex. 2 such as, "I took 1 from the 4 and added it to the 2 and got 12." Insist that 1 of the 4 dimes was changed to 10 pennies, making 12 pennies in all.

Key: 3. 15¢, 17¢, 66¢, 57¢, 19¢, 24¢, 45¢.

Page 147

Aim: To extend the operation of regrouping in subtraction

Suggestions: Start with the place pocket chart and bundles of 10 sticks and single sticks. Let the class see what happens when it is impossible to take 8 sticks from 5 sticks. Urge the pupils to take out a bundle of 10 and break up the bundle into single sticks. The 10 new sticks added to the 5 already in the ones place will give 15 sticks. Now it is possible to take away 8 sticks from the 15 sticks, leaving 7 sticks. There are, however, only 3 bundles of sticks left in the tens pocket; when 2 of these are taken away, only one bundle of 10 sticks remains. At this point it is well to ask what happened to the other bundle of 10 sticks. A good discussion of this step will help the slower pupil understand the entire regrouping operation. Some teachers prefer to use a different method. They have two boys go to the front of the room. One boy is called the tens boy; the second boy is called the ones boy. Naturally, the tens boy can hold only bundles of 10 sticks, whereas the ones boy holds only single sticks. The tens boy takes 4 bundles of 10 and holds them in his hand, and the ones boy takes 5 single sticks and holds them before the class. The teacher approaches the ones boy and asks him for 8 sticks. Since the ones boy does not have 8 sticks, it is necessary for the tens boy to give him a bundle of 10 sticks. The ones boy immediately breaks up the bundle into single sticks (as the ones boy holds only ones). Since the ones boy then has 15 sticks, he can give the teacher 8 sticks. The teacher then approaches the tens boy and asks for 2 bundles of sticks. The boy hands over 2 bundles of 10 sticks. The teacher then shows the class the 2 bundles of 10 sticks and the 8 single sticks and asks the class how many sticks are left. The class responds by saying that they see one bundle of 10 sticks and 7 single sticks. Again the teacher asks what happened to the other bundle of 10 sticks. The class answers that it was changed to 10 ones. Thus the class sees the regrouping take place and understands that one 10 is *all* that ever has to be changed. This, of course, is different from the carrying story in addition where sometimes 2 or even 3 tens are carried from the ones to the tens place. It is well for the class to see also how examples involving regrouping in subtraction can be checked by addition.

Key: 2. 25 dolls − 16 dolls = 9 dolls. **3.** 90¢ − 15¢ = 75¢. **4.** 40 minutes − 25 minutes = 15 minutes.

Page 148

Aims: To provide further practice in regrouping in subtraction; to extend the skill to more difficult examples

Suggestions: The full importance of the work begun on page 59 is now apparent. On that page, the pupil was taught to subtract a tens number from a tens and hundreds number, *i.e.*, 158 − 84. At that time changing was not required; but in reality, when it was impossible to take 8 tens from 5 tens, 1 hundred was changed to 10 tens. Ex. 5 and 6 are placed at this point to allow teachers to pave the way for double regrouping. Although the pupil may not need to change 1 hundred to work the example 154 − 79, nevertheless the regrouping concept can easily be related to this process. Again demonstrate, using pupils. This time, however, you will need a hundreds boy, who will hold a bundle of 100 sticks grouped as 10 tens. When it is impossible to subtract 7 tens from the 4 tens, the tens boy will reach over and change the bundle of 100 (which he will break up into 10 tens as he can hold only tens). Then he will have 14 tens from which 7 tens can be taken. Once again, the class sees the regrouping actually demonstrated.

Workbook Reference: Arithmetic Workshop, Book 3, page 57

Key: **1.** 34, 49, 13, 51, 56, 36, 16, 78. **2.** 27, 59, 13, 23, 18, 36, 46, 24. **3.** 25, 39, 28, 45, 68, 19, 38, 44. **5.** 75, 78, 59, 77, 96, 37. **6.** 27, 87, 95, 89, 48, 74.

Pages 149–150

Aim: To review basic addition and subtraction thought patterns

Suggestion: The thought patterns used in these problems have been adequately developed on previous pages. If a pupil is unable to solve a certain problem, help him determine the thought pattern involved by pointing out the key words in the sentence.

Key: Page 149 **1.** 95¢ − 60¢ = 35¢. **2.** 25¢ + 10¢ + 5¢ = 40¢; yes. **3.** 24 sheets − 11 sheets = 13 sheets. **4.** 10¢ + 12¢ + 7¢ = 29¢. **5.** 75 stamps + 36 stamps + 50 stamps = 161 stamps. **6.** 75¢ − 35¢ = 40¢. **7.** 25¢ + 25¢ = 50¢. **8.** 6 points + 9 points + 5 points + 8 points = 28 points. **9.** 7 points + 4 points + 10 points + 6 points = 27 points; Peter's.

Page 150 **1.** 18 children + 12 children = 30 children. **2.** 50 minutes − 15 minutes = 35 minutes. **3.** 35 − 19 = 16 (boys). **4.** 5 eggs + 8 eggs + 4 eggs = 17 eggs; more. **5.** 90¢ − 53¢ = 37¢. **6.** 24 + 22 = 46 (children). **7.** 6 bears + 3 bears + 8 bears = 17 bears. **8.** 8 lions − 5 lions = 3 lions.

Page 151

Aims: To present a completion test in arithmetic; to review terms used in the chapter

Suggestions: This type of test is well known to the third-grade child because of the many similar situations in reading workbooks. Remind the pupils *not to write* in the textbook. Assist them by suggesting that they number a piece of lined paper from 1–18 and explain that the answer to each question should be written on the line directly following the number.

Key: **1.** Nickels. **2.** Foot. **3.** Thousands. **4.** Tuesday. **5.** Half. **6.** Month. **7.** Fact. **8.** June. **9.** Thousand. **10.** Dozen. **11.** Zero. **12.** Subtraction. **13.** Add. **14.** Subtract. **15.** Fourth. **16.** Foot. **17.** Minutes, hour. **18.** Subtract.

Page 152

Aim: To maintain the skill of regrouping in subtraction

Suggestions: Ex. 1–3 and 8–8 should be done orally. Encourage the more advanced pupils to form their own arithmetic group and complete ex. 4–7 orally, thus strengthening their ability in mental arithmetic. Those who are not able to do this should be permitted to take out their play money or to use bundles of sticks to discover the answers to these examples.

Key: **2.** 50¢ – 44¢ = 6¢. **3.** 40¢ – 35¢ = 5¢. **4.** 17, 8, 19, 7, 16, 3, 29, 4. **5.** 32, 5, 39, 9, 29, 8, 4, 16. **6.** 8, 17, 9, 25, 8, 26, 35, 6. **7.** 8, 38, 7, 49, 6, 23, 7, 44. **8.** 28¢ – 19¢ = 9¢. **9.** 25 tickets – 18 tickets = 7 tickets.

Page 153

Aim: To provide further practice in solving one-step word problems

Suggestions: You may excuse the more able pupils from completing these review problems and permit them to turn their attention to the arithmetic corner of the room. In this corner will be found interesting games and puzzles in the field of arithmetic together with brain teasers which various children have brought to school. It is important to keep the materials in this arithmetic corner fresh and new. The same materials displayed continually will tend to dampen enthusiasm. Each week some new puzzles and games should be added.

Key: **1.** 20 minutes + 35 minutes = 55 minutes. **2.** 90¢ – 26¢ = 64¢. **3.** 52 – 35 = 17 (boys). **4.** 4:15. **5.** Less. **6.** 32 chickens – 26 chickens = 6 chickens. **7.** 85¢ – 8¢ = 77¢. **8.** 25¢ + 34¢ + 18¢ = 77¢; yes.

Page 154

Aim: To extend subtraction concepts to include "how many are gone" and "how much is spent"

Suggestion: These concepts are commonly known by most third-grade children. Encourage the class to make up their own problems dealing with these concepts.

Workbook Reference: Arithmetic Workshop, Book 3, page 59

Key: **1.** 9 puppies – 4 puppies = 5 puppies. **2.** 10 rabbits – 6 rabbits = 4 rabbits. **3.** 15¢ – 10¢ = 5¢. **4.** 48 cookies – 27 cookies = 21 cookies.

Page 155

Aim: To provide an oral review for the more able pupils and a written review for the rest of the class

Key: **1.** 53¢ − 28¢ = 25¢. **2.** 8¢ + 7¢ + 5¢ + 6¢ = 26¢. **3.** 10¢ + 10¢ + 10¢ + 5¢ = 35¢. **4.** Less; 12 inches − 7 inches = 5 inches. **5.** 31, 48, 49, 12, 57, 53, 150. **6.** 24, 14, 19, 51, 92, 86, 62. **7.** 52, 66, 7, 7, 29, 84, 422. **8.** 36, 83, 18, 30, 74, 53, 66. **9.** 69, 179, 229, 79. **10.** 178, 30, 586, 53. **11.** 127, 167. **12.** 160, 129. **13.** 204, 159. **14.** 184, 195. **15.** 214, 389.

Page 156

Aim: To review some of the major aims of Chapter 4

Suggestion: The work on this page reviews three of the five aims listed at the beginning of Chapter 4 of this Guide, as follows:

Chapter Review	*Aim Number*
Ex. 1–8	2
Ex. 9	1
Ex. 10–14	4

Aim 5 is thoroughly reviewed in the Problem Test on the next page and aim 3, in the diagnostic test on page 158.

Workbook Reference: Arithmetic Workshop, Book 3, page 58

Key: **1.** 44, 90, 43, 61. **2.** 21, 61, 53, 32. **3.** 52, 73, 21, 45. **4.** 92, 33, 51, 29. **5.** 21, 34, 47, 50. **6.** 41, 24, 26, 62. **7.** 21, 23, 19, 23, 19, 22, 15, 24. **8.** 99, 99, 98, 127, 179, 120, 146, 124. **9.** 63, 10, 28, 48, 49, 16, 56, 28. **10.** Twelve. **11.** Twelve. **12.** Yes. **13.** Less. **14.** More; 18 inches − 12 inches = 6 inches.

Page 157

Aim: To present Problem Test 4

Suggestion: By this time almost every pupil will be able to read these problems. However, a slow reader should still be provided with a reading partner.

Key: **1.** 36 pencils − 31 pencils = 5 pencils. **2.** 48 cookies + 96 cookies = 144 cookies. **3.** 9¢ + 5¢ + 3¢ + 8¢ = 25¢. **4.** 30 − 17 = 13 (boys). **5.** 45 minutes − 25 minutes = 20 minutes. **6.** 35 tickets + 8 tickets = 43 tickets. **7.** 50 tickets − 13 tickets = 37 tickets. **8.** 25 pictures + 9 pictures + 16 pictures = 50 pictures. **9.** 16 inches − 12 inches = 4 inches. **10.** 12 roses + 12 roses = 24 roses, or 2 dozen roses.

Page 158

Aim: To provide a diagnostic test on addition and subtraction skills taught so far in the text

Suggestion: Permit every pupil to correct his own paper and assign himself extra practice work.

Workbook Reference: Arithmetic Workshop, Book 3, page 61

Key: **1.** 89, 89, 97, 67, 119, 109. **2.** 22, 47, 36, 64, 92, 51. **3.** 93, 42, 84, 125, 130, 104. **4.** 94, 119, 176, 180, 194, 203. **5.** 20, 23, 25, 20, 23, 20. **6.** 43, 22, 74, 60, 312, 235. **7.** 29, 52, 48, 56, 85, 78. **8.** 5, 9, 8, 6, 5, 5.

Chapter 5

Aims of Chapter 5. The major aims of Chapter 5 are to:

1. Maintain and redevelop the skills and understandings taught in the previous chapters.
2. Teach the Roman numerals I–XII.
3. Reteach double carrying in addition and extend it to 3-figure numbers, dollars and cents.
4. Reteach regrouping in subtraction (from tens place only) and to extend it to 3-figure numbers and dollars and cents.
5. Teach regrouping in subtraction from hundreds place.
6. Teach double regrouping in subtraction and extend it to dollars and cents.
7. Teach the subtraction process step involving double zeros in the minuend.
8. Introduce the expression *decimal point* in dollars and cents situations.
9. Provide a classroom experience in experimenting with liquid measure (cups, pint, quart).
10. Provide experiences in making change (limit of $1).
11. Extend subtraction thought patterns in problem-solving situations.

Pages 159–160

Aims: To reteach the reading of 4-place numbers; to stress an understanding of place value

Suggestions: This is a review of the work completed on pages 93–94. Once again the pupil is shown different ways of expressing large numbers. Be sure to provide the opportunity for recognizing how many ones, tens, hundreds, and thousands there are in each number.

In teaching the writing of numbers, emphasize the fact that the value of each figure depends on the place it occupies. This is known as *place value* and is a feature that characterizes our Hindu-Arabic system of writing numbers as compared with the Roman system. As illustrations of place value, point out that in a number like 283, the 3 means 3 *ones*, the 8 means 8 *tens* or 80, and the 2 means 2 *hundreds* or 200. In the number 307, the 0 shows that there are *no* tens. By writing the 0, you fill the tens place with the figure 0. Since the 0 *fills* the tens place, it pushes the 3 of 307 over to the hundreds place and keeps the 7 in the ones place. In cases like this, the zero is sometimes called a *place holder*. Zero, of course, in this case means *not any* or *no* tens. It is desirable for pupils to form the habit of using the word *zero* rather than "naught" in speaking of the symbol 0. In writing numbers it is customary to place a comma after the thousands figure in a 5-figure number like 17,234 for ease in reading the number. Sometimes a comma is placed after the thousands figure in a 4-figure number like 2764, but the comma is more often omitted. The comma never appears in a 4-figure number that represents a year, such as 1963 or 1492.

Workbook Reference: Arithmetic Workshop, Book 3, page 60

Key: Page 159 **2.** 4000, 5000, 6000, 7000, 8000, 9000, 10,000. **3.** 5 thousand 6 hundred, or 56 hundred; 4 thousand 9 hundred, or 49 hundred; 8 thousand 4 hundred, or 84 hundred; 1 thousand 7 hundred, or 17 hundred; 2 thousand 5 hundred, or 25 hundred; 6 thousand 1 hundred, or 61 hundred; 3 thousand 2 hundred, or 32 hundred; 7 thousand 8 hundred, or 78 hundred.

Page 160 **2.** Five thousand three hundred sixty-seven, or fifty-three hundred sixty-seven, or five, three, six, seven. **3.** Nine thousand eight, or ninety hundred eight, or nine, 0, 0, eight; five thousand two, or fifty hundred two, or five 0, 0, two; six thousand fifteen, or sixty hundred fifteen, or six, 0, one, five. **8.** 2109.

Page 161

Aims: To teach the writing of dollars and cents; to teach the recognition of the decimal point

Suggestions: Use the closed-book approach to this lesson. Prepare a poster of advertisements cut from a newspaper. Each advertisement will include the prices of articles in dollars and cents. Try to find cutouts that are colorful and illustrative of different ways of expressing dollars and cents. Most of the children will be able to recognize these amounts of money, and the rest of the class will learn them quickly. The greatest single difficulty will be found in explaining that numbers such as 65¢ can be written also as $.65 or $0.65, and that 5¢ can be written also as $.05 or $0.05. *Refer to the decimal point only as a dot that separates the dollars from the cents.* The study of decimal fractions, as such, is not introduced until the fifth grade, and thus no reference is made to the "decimal point in the answer." However, it is easily seen that this groundwork will make excellent readiness for later learning.

Key: **5.** Three dollars and seventy-five cents; one dollar and forty cents; thirty dollars; four dollars and ninety-five cents. **6.** Seven dollars, six dollars and three cents, thirty-five dollars, eighty-seven cents, ten cents, five dollars. **7.** One dollar and forty cents, three dollars and seventy-five cents, ten dollars and twenty-five cents, nine cents, forty cents, one dollar. **8.** $5.15, $0.08. **9.** $8.60, $0.04. **10.** $4.07, $0.17.

Pages 162–164

Aim: To reteach column addition of 3-figure numbers with two addends and carrying from the ones place

Suggestions: This is an extension of the work studied in the previous chapter where 2-figure numbers and two addends were used. Notice that this work starts with dollars and cents. Be sure that the pupil realizes that he is adding cents to cents, dimes to dimes, and dollars to dollars. Call attention to the fact that it is unnecessary in column addition to repeat the dollar sign before each addend. A mastery of the work on page 162 will make quite simple the transition to abstract numbers on page 163. If necessary, have the pupils repeat that they are adding ones to ones, tens to tens, and hundreds to hundreds. In every example, the carrying takes place from the ones place to the tens place. Page 164 introduces the zero difficulty and requires the rewriting of some of the examples (12–14) from horizontal to vertical form. A very advanced pupil might attempt ex. 7–14 from a mental arithmetic point of view and use his own short cuts in arriving at the sums. This is excellent enrichment work for the better pupil.

Workbook Reference: Arithmetic Workshop, Book 3, pages 62 and 64

Key: Page 162 **2.** \$5.91, \$8.51, \$8.90, \$3.95, \$2.86, \$6.80. **3.** \$7.53, \$4.75, \$6.94, \$5.43, \$3.63, \$7.40.

Page 163 **2.** 637, 773, 285, 450, 772, 883. **3.** 980, 521, 356, 863, 982, 541. **4.** 564, 965, 983, 543, 670, 334. **5.** 761, 411, 837, 582, 655, 443.

Page 164 **1.** 125 stamps + 135 stamps = 260 stamps. **2.** 228 children + 269 children = 497 children. **3.** 976, 650, 690, 964, 968, 870. **4.** 776, 664, 890, 395, 941, 634. **5.** 472, 591, 851, 883, 790, 373. **6.** 861, 951, 982, 687, 931, 850. **7.** 704 + 239 = 943; 127 + 536 = 663. **8.** 553 + 429 = 982. **9.** 318 + 229 = 547; 146 + 229 = 375; 437 + 229 = 666. **10.** 215 + 108 = 823. **11.** 319 + 102 = 421. **12.** 664, 790, 774. **13.** 478, 450, 653. **14.** 495, 151, 772.

Page 165

Aim: To provide further practice with problem-solving situations in which process work is mixed

Suggestion: These problems will capture the imagination of the pupils. They center around hobbies, movies, and music. Most children will already have experienced similar activities and will readily understand how to solve the problems.

Key: **1.** 15¢ + 39¢ + 35¢ = 89¢. **2.** 50¢ + 25¢ + 10¢ + 5¢ = 90¢. **3.** 45 minutes − 30 minutes = 15 minutes. **4.** 25 tops + 18 tops = 43 tops. **5.** 218 + 225 = 443 (children). **6.** 375 stamps − 320 stamps = 55 stamps from other countries. **7.** 375 stamps − 125 stamps = 250 stamps. **8.** Yes; 25¢ + 25¢ = 50¢, 50¢ − 35¢ = 15¢. **9.** 50¢ − 11¢ = 39¢. **10.** 128 pages + 144 pages = 272 pages.

Page 166

Aim: To extend the carrying idea from the tens to the hundreds place

Suggestions: Up to this time, most of the work in addition has been centered on carrying from the ones to the tens place. Now the carrying is from the tens to the hundreds place; money situations are used to explain this new skill. The pupil finds that when he adds the dimes, he has more than 10 dimes; thus, the sum becomes a dollar and some dimes left over. The "extra" dollar is carried over to the dollars column and added to the dollars already showing. The illustrative example provides excellent clues as to the thought process involved. Some children will enjoy using their toy money to demonstrate this and similar examples.

Key: **2.** \$9.48, \$9.19, \$6.85, \$4.69, \$8.06, \$9.56. **3.** \$6.79, \$8.56, \$7.48, \$3.42, \$5.37, \$7.38.

Pages 167–168

Aim: To translate the new learning of page 166 to abstract numbers

Suggestions: The pupils repeat that they are adding ones to ones, tens to tens, and hundreds to hundreds. They will notice that since the tens column results in a sum greater than 10, 10 of the tens are changed to 1 hundred and it is added to the hundreds already expressed in the example. Place pocket charts and bundles of sticks become excellent visual aids for furthering the understanding of what is taking place. Some zeros appear in the addends, but by this time they should cause no difficulty.

Workbook Reference: Arithmetic Workshop, Book 3, page 63

Key: Page 167 **1.** 535 miles. **2.** 372 miles + 255 miles = 627 miles. **3.** 444, 853, 806, 509, 907, 827. **4.** 779, 629, 915, 827, 819, 536. **5.** 767, 809, 627, 756, 815, 544. **6.** 434, 963, 509, 209, 833, 725.

Page 168 **1.** 608. **2.** 439. **3.** 335. **4.** 986. **5.** 907, 866, 318. **6.** 855, 636, 208. **7.** 735, 927, 828. **8.** 884, 359, 326. **9.** 432 cans + 192 cans = 624 cans. **10.** 160 pages + 144 pages = 304 pages. **11.** 472 valentines + 434 valentines = 906 valentines. **12.** 919, 840, 784, 506, 743. **13.** 851, 584, 518, 685, 609.

Page 169

Aim: To teach the Roman numerals I–XII

Suggestions: The use of Roman numerals appears to be disappearing from American life. There was a time when Roman numerals appeared frequently on clock faces, in books, and on many public buildings. However, their greatest use — on clock faces — has almost disappeared. *American Arithmetic, Grade 3* introduces Roman numerals at this point as an appreciation lesson. These numerals represent another number system used by ancient peoples. Remnants of this number system appear in encyclopedias, cornerstones of churches, and publications. Some of the more inquisitive youngsters may be urged to find several such numbers and report their findings to the class. If such a project is undertaken, go beyond the limits of XII to translate the numbers for the class.

Workbook Reference: Arithmetic Workshop, Book 3, page 12

Key: **4.** 4. **5.** 11; 6; 12. **6.** IV, VIII, XI, VII, IX. **7.** 3, 10, 7, 12, 4, 9.

Pages 170–171

Aim: To teach double carrying in addition examples of 2 addends and 3-figure numbers

Suggestions: Here is an easy extension of the work developed on pages 167–168. Notice that ex. 1 on page 170 deals with school population figures. Insist that the pupils discuss the work and explain *how and why* they are carrying. Ample practice is provided on page 171 without any zero difficulties.

Workbook Reference: Arithmetic Workshop, Book 3, page 65

Key: Page 171 **1.** 442, 914, 713, 912, 302, 760. **2.** 863, 837, 745, 902, 871, 834. **3.** 772, 725, 950, 553, 554, 916. **4.** 245 buttons + 178 buttons = 423 buttons. **5.** 463 stamps + 168 stamps = 631 stamps. **6.** 278 shells + 325 shells = 603 shells. **7.** 492 + 218 = 710; 496 + 208 = 704. **8.** 356 + 154 = 510; 297 + 657 = 954; 264 + 386 = 650. **9.** 666, 400, 900. **10.** 801, 925, 311. **11.** 823, 204, 848.

Pages 172–173

Aim: To extend the skill learned on the preceding pages to examples in column addition with 3-figure numbers and 3 addends

Suggestions: The extension of this work to 3 addends from 2 addends will present little difficulty, but notice that zeros and ragged columns are also in evidence. However, a sound understanding of *place value* will prevent difficulties that would otherwise arise. If the problem situation on page 172 seems out of season, a similar situation involving the Easter holiday may be substituted. Ex. 3–5 on page 172 make excellent readiness material for the addition of decimal fractions in later grades. Once again, *stress the nature of the decimal point* (it separates the dollars from the cents).

Workbook Reference: Arithmetic Workshop, Book 3, page 66

Key: Page 172 **1.** Add the dollars: 4 + 1 = 5; write 5 in dollars place. **2.** $1.49 + $3.98 + $1.75 = $7.22. **3.** $9.20, $4.42, $7.37, $8.03, $6.41. **4.** $9.27, $9.84, $8.90, $4.26, $9.28. **5.** $9.29, $3.01, $8.27, $9.10, $8.45. **6.** $3.25, $7.61. **7.** $9.75, $2.70.

Page 173 **1.** $9.94 + $8.89 = $18.83. **2.** $1.25 + $1.35 + $.95 = $3.55. **3.** $4.75 + $5.35 = $10.10. **4.** $3.27, $7.57, $6.25, $5.00, $2.31. **5.** $9.31, $11.44, $5.25, $8.30, $11.62.

Page 174

Aim: To review subtraction with and without regrouping and addition with double carrying

Suggestions: This page provides 29 examples in subtraction and 26 examples in addition. No new process work is included. Children who appear to be uncertain about this work should review the basic addition and subtraction facts taught in Chapter 2. Most of this work might well be of an oral nature. Certainly ex. 1–4 should be done orally by most of the class, and the faster pupils could work ex. 8–11 orally.

Key: **1.** 32, 15, 8, 25, 371, 71, 470. **2.** 69, 25, 3, 43, 45, 64, 110. **3.** 41, 19, 8, 13, 66, 60, 321. **4.** 38, 59, 27, 23, 332, 62, 54. **5.** 90 marbles − 75 marbles = 15 marbles. **6.** 22¢ + 15¢ + 49¢ = 86¢. **7.** $3.98 + $2.75 = $6.73. **8.** 736, 291, 333, 452, 758, 702. **9.** 449, 541, 598, 922, 909, 983. **10.** 883, 634, 683, 665, 525, 917. **11.** 200, 760, 1364, 549, 717, 892.

Page 175

Aim: To explain the use of zero as a place holder in adding dollars and cents

Suggestions: The addition of money is taught in Grade 3 with slight reference to the decimal point. Pupils have been previously instructed as to the proper way of writing dollars and cents. This understanding combined with a knowledge of place value will make the examples on this page relatively easy to compute. Emphasize that cents are added to cents, dimes to dimes, and dollars to dollars. If zeros appear exclusively in the cents or the dimes column, a zero is placed in the sum unless a number has been carried over from the previous place. For instance, in the first example in line 2, "5 cents and 5 cents are 10¢. Place a 0 in the cents column and a 1 in the dimes column. Add \$5 and \$3 and get \$8. So the answer is \$8.10." These zeros provide no difficulty if they are treated as place holders.

$$\begin{array}{r} \$3.05 \\ \underline{5.05} \end{array}$$

Key: **2.** \$8.10, \$8.80, \$6.48, \$5.07, \$1.04. **3.** \$8.00, \$4.05, \$9.14, \$7.00, \$1.00. **4.** \$9.01, \$4.43, \$3.05, \$9.00, \$.74. **5.** \$7.57, \$8.18, \$5.08, \$7.50, \$1.20. **6.** \$9.07, \$6.90, \$5.09, \$3.60, \$1.30. **7.** \$6.00, \$9.00, \$9.60, \$10.00, \$1.04.

Page 176

Aim: To teach by the experimental method the measures: cups, pint, quart

Suggestions: In this work on liquid measure it is important to demonstrate in class that 2 pints make 1 quart. Show this by bringing to class empty pint and quart bottles and carrying out the experiment suggested in ex. 2 on this page. It is desirable also to demonstrate in class that 2 glasses equal 1 pint. Be sure to select a glass of standard size so that two of these glasses of water will just fill the pint bottle. Small glasses or extra large glasses are not suitable for this purpose. Two cups are also equal to one pint, but the standard measuring cup is the one to be used.

Some children will enjoy bringing to class a recipe to illustrate how their mothers use these measures in cooking. An even more important enrichment activity is to place a quantity of water before the class and ask the pupils to estimate the amount. Is the container of water equivalent to a $\frac{1}{2}$ pint, a pint, or a quart? Use different sized containers and provide ample opportunity for the pupils to estimate liquid measures. Also, it might be well to conduct a short review of such measures as *dozen*, *inch*, and *foot*.

Key: **1.** 2 cups. **2.** 2 pints. **3.** Yes; 4 glasses.

Page 177

Aim: To show how to add money numbers representing cents when the sum is 100¢ or more

Suggestions: This page involves the practical application of the fact that 100¢ make \$1.00. When an answer is 100¢ or more, such as 135¢, the pupil should change 135¢ to \$1.35. Emphasis should be placed also on the relationship of this principle to place value and on the fact that in reality \$1.00 is 100 cents and therefore the 1 is in the hundreds place.

Key: **2.** 75¢ + 45¢ + 35¢ = \$1.55. **3.** 80¢ + 50¢ + 95¢ = \$2.25. **4.** 65¢ + 40¢ + 78¢ = \$1.83. **5.** 65¢ + 21¢ + 22¢ = 108¢ or \$1.08. **6.** \$1.85, \$1.56, \$1.29, \$1.77, \$1.45, \$1.49, \$1.60.

Pages 178–180

Aim: To provide experiences in making change for coins up to and including \$1.00

Suggestions: The work in previous chapters dealing with coins and their equivalents has been excellent readiness for this activity. Many children have become proficient at this skill through their experiences in class with milk and lunch money and through their help at home in running errands. Now is the right moment to organize the Toy Store. Christmas is over, and the children may be glad to lend their toys to the store. Toy money has been used frequently and will provide the necessary medium of exchange, and the arithmetic corner can be remodeled and a store front built of cardboard boxes and orange crates. Once the Toy Store is in operation, a certain amount of time each week can well be devoted to this interesting and fascinating activity. Be sure to stress the *additive nature* of making change. Most change-making situations and thought processes are additive. Hence avoid suggesting to pupils that they write the amounts of money and subtract. Change making in real life is generally a mental operation. The customer watches and counts with the store clerk as the change is received. An excellent learning connected with change making is the custom of stating the amount of money the child-customer is giving the store clerk. Any argument of exactly how much the customer gave the clerk can thus be avoided.

Key: Page 178 **2.** 18, 19, 20, 25; 7¢ change. **3.** 5, 15, 25; 20¢ change.

Page 179 **4.** 5, 10, 15, 25 or 5, 10, 15, 20, 25; using two dimes. **5.** 13, 14, 15, 20; 7¢ change; 3 coins. **6.** 17, 18, 19, 20, 25; 9, 10, 15, 25; 4, 5, 15, 25; 15, 25; 2, 3, 4, 5, 15, 25; 11, 12, 13, 14, 15, 25; 14, 15, 25. **7.** 15, 20; 17, 18, 19, 20; 12, 13, 14, 15, 20; 18, 19, 20; 11, 12, 13, 14, 15, 20; 14, 15, 20; 16, 17, 18, 19, 20.

Page 180 **1.** The boat cost 29¢; Joe gave the man 50¢. **2.** 45; 50; 1 penny and 4 nickels. **3.** 23 (or 23, 24), 25, 50; 27¢; 19, 20, 25, 50; 36 (or 36, 37, 38, 39), 40, 50; 8 (or 8, 9), 10, 15, 25, 50. **4.** 1 quarter. **5.** 24, 25, 50, \$1.00. **6.** 72 (or 72, 73, 74), 75, \$1.00. **7.** 63 (or 63, 64), 65, 75, \$1.00. **8.** 88 (or 88, 89), 90, \$1.00. **9.** 19, 20, 25, 50, \$1.00. **10.** 27 (or 27, 28, 29), 30, 40, 50, \$1.00. **11.** 55, 65, 75, \$1.00. **12.** 75, \$1.00. **13.** 36 (or 36, 37, 38, 39), 40, 50, \$1.00. **14.** 81 (or 81, 82, 83, 84), 85, 90, \$1.00. **15.** 47 (or 47, 48, 49), 50, \$1.00. **16.** 92 (or 92, 93, 94), 95, \$1.00. **17.** 25, 50, \$1.00. **18.** 60, 70, 75, \$1.00. **19.** 40, 50, \$1.00. **20.** 50, \$1.00.

Pages 181–182

Aim: To teach regrouping from the tens place in subtraction of 3-place numbers

Suggestions: This is an extension of the skill developed on pages 146–147 where the work was confined to 2-place numbers only. Notice the use of helping figures to illustrate the regrouping concept. More advanced pupils should be encouraged to avoid this crutch and to keep such numbers in mind. Page 182 presents examples using abstract numbers only. Be certain that the children discuss the process by stating that "since 9 ones cannot be taken from 3 ones, we change one of the 8 tens (leaving 7 tens) to 10 ones and add them to the 3 ones to get 13 ones. Now subtract 9 ones from 13 ones and write 4 ones. Subtract 4 tens from 7 tens and write 3 tens. Subtract 5 hundreds from 6 hundreds and write 1 hundred."

Workbook Reference: Arithmetic Workshop, Book 3, page 79

Key: Page 181 **2.** \$2.35, \$1.68, \$1.24, \$8.39, \$2.13. **3.** \$2.09, \$3.69, \$1.26, \$7.37, \$1.48.

Page 182 **2.** 165, 507, 124, 439, 135, 238. **3.** 777, 16, 343, 367, 419, 46. **4.** 249, 226, 307. **5.** 504, 553, 918. **6.** 228, 108, 736. **7.** 162, 148, 507.

Page 183

Aims: To present a completion test dealing primarily with money; to review some special terms

Key: **1.** Quart. **2.** Quarter. **3.** October. **4.** December. **5.** Hundreds, tens, ones. **6.** Sum. **7.** Dollars, cents. **8.** Dollar (dollars); cent (cents). **9.** Hour. **10.** Subtract. **11.** Subtract. **12.** Addition. **13.** Add. **14.** Quarter, nickel, dimes. **15.** Fourth. **16.** Change. **17.** Third.

Pages 184–185

Aim: To teach regrouping from the hundreds place in subtraction

Suggestions: Up to this point, regrouping in subtraction has been from tens place only. Now by means of dollars and cents, the pupil is instructed in the extension of this concept to hundreds place. Now dollars are being changed to dimes rather than dimes to cents. (See page 146.) Encourage the class to use their play money to demonstrate the *why* of this operation. Provide ample class demonstrations of this concept before allowing pupils to do the work in ex. 2 and 3 of page 184. A simple transition on page 185 takes place in which the dollars become hundreds; the dimes, tens; and the cents, ones. Teachers will use the place pocket chart or children (hundreds boy, tens boy, ones boy) to illustrate the example $458 - 395 = 63$.

Workbook Reference: Arithmetic Workshop, Book 3, page 81

Key: Page 184 **2.** \$.237, \$1.43, \$6.64, \$1.55, \$3.85. **3.** \$4.92, \$2.98, \$4.94, \$.83, \$1.62.

Page 185 **2.** 81, 81, 173, 192, 375, 41. **3.** 382, 465, 418, 54, 351, 290. **4.** 272, 64, 695, 677, 47, 284. **5.** 96, 136, 162, 333, 144, 70. **6.** 85, 223, 195, 373, 51, 560.

Page 186

Aim: To teach subtraction involving zeros in the minuend or the subtrahend

Suggestions: The only difference between the examples on this page and those completed on page 185 is in the nature of the minuend. Most of these examples have a zero (or zeros) in the minuend or the subtrahend. When there is a zero in the subtrahend, the pupil experiences little difficulty (see problem 1 in ex. 1); but the second example in ex. 1 can prove troublesome. Here the child is required to make the following mental calculations:

(1) There is nothing to subtract in the ones place as 0 appears in both the minuend and the subtrahend.
(2) Since 8 tens cannot be subtracted from 0 tens, it is necessary to change 1 hundred to 10 tens, thus leaving 2 hundreds in the hundreds place. Now 8 tens can be subtracted from 10 tens.

Problem 5 in ex. 1 differs slightly from the illustration above as the regrouping takes place from the tens number; when 1 ten is changed, 5 tens remain. When 5 tens are taken away from 5 tens, 0 tens remain; thus a zero is placed in the tens place of the answer. In the development of this work, you may find it necessary both to review the zero subtraction facts (page 85) and to use the examples in addition on page 175 as a contrast. Some teachers will prefer to illustrate an example by using children and bundles of thin sticks. The example at the right might be illustrated as follows:

$$\begin{array}{r} 300 \\ -\ 180 \\ \hline \end{array}$$

Have a hundreds boy hold 3 bundles of 100, a tens boy hold no bundles of ten, and a ones boy have no single sticks. These three boys represent the number 300. Approach the tens boy and ask for 8 bundles of 10 (naturally there was no purpose in approaching the ones boy as you have no need for any single sticks). The tens boy indicates that he has no bundles of ten and turns to the hundreds boy with a request for a bundle of one hundred sticks. The tens boy breaks this bundle up into 10 groups of ten (as he can hold only bundles of ten) and gives you 8 bundles of ten. This leaves the tens boy with 2 bundles of ten. Then ask the hundreds boy for a bundle of 100. Now you have taken 180 sticks from the boys, leaving 120 sticks with them.

Key: 3. 300 miles − 170 miles = 130 miles. **4.** 400 hens − 340 hens = 60 hens. **5.** 206, 105, 30, 393, 20, 80. **6.** 170, 207, 157, 207, 405, 124. **7.** 306, 40, 138, 259, 198, 300. **8.** 106, 208, 307, 109, 60, 61. **9.** 850, 190, 254, 124, 89, 606. **10.** 70, 102, 600, 303, 208, 410.

Page 187

Aim: To provide practice with a series of mixed examples

Key: 1. 571. **2.** 260. **3.** 225. **4.** 8 thousands, 4 hundreds, 0 tens, 6 ones. **5.** 9¢, $.09. **6.** 79, 80, 90, $1.00 or 79, 80, 85, 90, $1.00; 21¢ change. **7.** 498, 463, 789, 708. **8.** 825, 938, 977, 604, 536, 874. **9.** 28¢ + 36¢ + 75¢ = $1.39. **10.** 2 glasses + 4 glasses = 6 glasses. **11.** 665, 136, 39, 82, 191, 240. **12.** 307, 234, 247, 48, 150, 384.

Pages 188–189

Aim: To extend the subtraction concepts in problem solving to include such terms as: how much longer, shorter, taller, older, less *than*

Suggestions: Most of these terms are already part of the everyday vocabulary of third-grade children, and little difficulty will be encountered in the completion of these word problems. Ex. 12–15 on page 189 provide further practice in using a ruler. At this time a quick review of the number of inches in a foot should be made.

Key: Page 188 **3.** 15 years − 8 years = 7 years. **4.** 72 inches − 51 inches = 21 inches.

Page 189 **5.** 51 inches − 43 inches = 8 inches. **6.** 15 years − 11 years = 4 years. **7.** 18 inches − 14 inches = 4 inches. **8.** 245 buttons − 185 buttons = 60 buttons. **9.** 55 minutes − 40 minutes = 15 minutes. **10.** 325 marbles − 200 marbles = 125 marbles. **11.** 16 inches − 12 inches = 4 inches. **12.** 2 inches. **13.** 2 inches. **14.** 3 inches. **15.** 1 inch.

Pages 190–191

Aim: To teach double regrouping in subtraction of 3-place numbers

Suggestions: If the work on pages 146–148 and 185 has been mastered and the close relationship between regrouping and the tens nature of our number system fully understood, then this new work will prove quite simple. However, it is recommended that the class be urged to visualize the illustrative example on page 190 by using a place pocket chart or children (see the suggestions for teaching page 147). Let the class see that the ones boy, having no sticks, must obtain 1 ten from the tens boy. Let the tens boy in turn take a bundle of 100 sticks (10 bundles of ten) from the hundreds boy and thus increase his bundles of 10 from 3 to 13. This leaves the hundreds boy with only 4 bundles. Provide ample opportunity for the class to discuss and act out this idea.

Workbook Reference: Arithmetic Workshop, Book 3, pages 84 and 85

Key: Page 190 **3.** 386, 448, 232. **4.** 287, 159, 498.

Page 191 **1.** 635 tickets − 278 tickets = 357 tickets. **2.** 224 children − 198 children = 26 children. **3.** 422 − 225 = 197 (boys). **4.** 942 − 655 = 287. **5.** 814 − 347 = 467. **6.** 264, 273, 153, 485, 179, 187. **7.** 392, 58, 353, 95, 195, 397. **8.** 55, 249, 298, 69, 268, 479. **9.** 487, 48, 249. **10.** 296, 118, 637. **11.** 96, 104, 150. **12.** 160, 86, 74.

Page 192

Aims: To provide oral practice in adding by endings and in making change; to check understanding of place value

Key: **1.** (See answers for those pages.) **2.** 37, 52, 26, 24, 58, 101, 49, 80, 73. **3.** 38, 53, 27, 25, 59, 102, 50, 81, 74; 40, 55, 29, 27, 61, 104, 52, 83, 76; 41, 56, 30, 28, 62, 105, 53, 84, 77. **4.** 22, 37, 11, 9, 43, 86, 34, 65, 58, 30, 45, 19, 17, 51, 94, 42, 73, 66. **5.** 15, 11, 42. **6.** 12, 17, 22. **7.** 15, 14, 15. **8.** 14, 11, 65. **9.** 15, 10, 43. **10.** 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120; 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75. **11.** 80; 100. **12.** Yes. **14.** Saturday.

15. Ten. **16.** 9999. **17.** 1000. **18.** 3 pennies and 1 dime, or 3 pennies and 2 nickels. **19.** 1 dime, or 2 nickels.

Pages 193–194

Aim: To teach the most difficult process step in subtraction — double zeros in the minuend

Suggestions: There are many ways of attacking this teaching-learning situation. One popular method is presented on page 193. Notice that the 500 becomes 4 hundreds, 9 tens, and 10 ones. It is now possible to subtract without further regrouping.

However, some teachers will prefer to use the pocket chart, play money, or children. If children are used and the example under consideration is 500 − 328, the hundreds boy would stand in front of the class with 5 bundles each containing one hundred sticks. The tens boy and the ones boy would stand empty-handed beside him. You would approach the ones boy and ask him for 8 sticks. The ones boy would ask the tens boy for a bundle of ten, and the tens boy would reply that he had none but could obtain a bundle of 1 hundred from the hundreds boy. The hundreds boy would give the tens boy a bundle of 1 hundred to break up into 10 bundles of ten; the tens boy in turn would give the ones boy one of the bundles of ten to break up into 10 ones. Now take 8 ones from the ones boy, 2 tens from the tens boy, and 3 hundreds from the hundreds boy. The basic learning in this lesson is *the tens nature of our number system* and that ones must be taken from ones, tens from tens, and hundreds from hundreds.

Key: Page 193 **2.** 316, 94, 687, 398, 161, 299. **3.** 25, 135, 188, 382, 86, 475. **4.** 393, 65, 554, 89, 44, 266. **5.** 318, 201, 229, 286, 218, 39. **6.** 153, 135, 272, 187, 206, 127.

Page 194 **1.** \$6.00 − \$4.25 = \$1.75. **2.** \$9.00 − \$7.25 = \$1.75. **3.** \$9.50 − \$7.75 = \$1.75. **4.** \$1.98 − \$.85 = \$1.13. **5.** 525, 143, 239, 159, 398, 315. **6.** 67, 453, 84, 307, 26, 165. **7.** 269, 277, 78, 382, 435, 148. **8.** 19, 304, 386, 222, 281, 148. **9.** 577, 46, 529, 28, 131, 199.

Page 195

Aim: To apply the addition and subtraction skills to examples dealing with dollars and cents

Suggestion: There are no new skills developed on this page. All addition work is limited to double carrying, adding by endings, and ragged columns. The subtraction work emphasizes double regrouping and zeros in the minuend.

Key: **1.** \$2.86 + \$.78 + \$1.65 = \$5.29. **2.** \$3.50 + \$5.00 + \$.75 = \$9.25. **3.** \$1.00 − \$.45 = \$.55. **4.** \$8.80, \$8.64, \$9.15, \$4.67, \$7.97. **5.** \$10.05, \$9.67, \$9.01, \$13.03, \$11.86. **6.** \$5.00 − \$3.77 = \$1.23. **7.** \$2.25 − \$1.75 = \$.50. **8.** \$1.76, \$5.55, \$3.13, \$1.66, \$1.76. **9.** \$.49, \$2.43, \$1.98, \$2.18, \$2.24.

Page 196

Aim: To review some of the major aims of Chapter 5

Suggestions: The work on this page reviews and tests understandings of eight of the aims listed in this Guide at the beginning of the chapter, as follows:

Chapter Review	*Aim Number*
Ex. 1–2	8
Ex. 3–4	1
Ex. 5	10
Ex. 6	9
Ex. 7–8	2
Ex. 9–10	3
Ex. 11–12	6 and 7

Aims 4 and 5 are reviewed in the diagnostic test on page 198 and aim 11 in the Problem Test that follows.

Key: **1.** \$4.15, \$5.00, \$7.50, \$.35, \$1.08, \$.70. **2.** 12¢, \$.12, 12 cents. **3.** Three thousand six hundred, or thirty-six hundred; nine thousand four hundred, or ninety-four hundred. **4.** 4 thousands, 6 hundreds, 2 tens, 9 ones. **5.** 31, 35, 40, 50; 25, 50; 43, 45, 50; 17, 20, 25, 50; 12, 15, 25, 50; 5, 15, 25, 50; 8, 10, 15, 25, 50. **6.** Four; two. **7.** Ten, four, eight, five, twelve. **8.** IX, III, VII, XI, IV or IIII, VI. **9.** 824, 839, 340, 820, 710, 396. **10.** 917, 712, 844, 600, 558, 755. **11.** 473, 16, 127, 89, 24, 647. **12.** 83, 132, 491, 479, 398, 107.

Page 197

Aim: To present Problem Test 5

Suggestion: The problem situations on this page are primarily devoted to subtraction thought patterns. Many of them involve money.

Key: **1.** 15 years − 9 years = 6 years. **2.** 50¢ + 30¢ + 15¢ = 95¢. **3.** \$2.00 − \$.22 = \$1.78. **4.** 1 dime, 1 quarter, 1 half dollar; 85¢ change. **5.** 65¢ + 29¢ + 19¢ = \$1.13. **6.** 362 children − 218 children = 144 children. **7.** 36 cards − 30 cards = 6 cards. **8.** 81 eggs − 15 eggs = 66 eggs. **9.** 15¢ + 8¢ + 5¢ + 2¢ = 30¢. **10.** \$3.00 − \$1.87 = \$1.13.

Page 198

Aim: To suggest a diagnostic test covering the addition and subtraction skills taught in this chapter

Suggestion: Ex. 1–4 feature single and double carrying examples in addition, whereas ex. 5–9 test single or double regrouping in subtraction. Aims 4 and 5 are adequately reviewed and tested on this page. Encourage the pupils to make self-assignments for any special practice work needed.

Key: **1.** 883, 472, 661, 682, 491. **2.** 877, 715, 829, 839, 559. **3.** 764, 936, 514, 913, 615. **4.** \$4.00, \$9.16, \$3.00, \$7.05. **5.** 244, 458, 327, 519, 636. **6.** 391, 137, 274, 170, 294. **7.** 214, 173, 300, 209, 50. **8.** 294, 367, 596, 368, 179. **9.** 443, 75, 524, 606, 265.

Chapter 6

Aims of Chapter 6. The major aims of Chapter 6 are to:

1. Maintain the addition and subtraction skills taught in previous chapters.
2. Explain the association of multiplication with addition.
3. Teach the multiplication facts for 1, 2, 3, 0.
4. Teach multiplication with 1-figure multiplier and 2- or 3-figure multiplicands without carrying.
5. Teach multiplication with 1-figure multiplier and 2- or 3-figure multiplicands with carrying.
6. Extend process work in multiplication to include dollars and cents in multiplicands.
7. Develop some multiplication thought patterns in word problems.
8. Discover the commutative principle in multiplication.
9. Experience a multiple-choice test with simple questions.
10. Extend linear measure to include the *yard.*

Page 199

Aim: To reteach counting by 2's, 5's, and 10's

Suggestions: By this time most children will experience no difficulty with this work, but the number chart which they made in connection with page 30 will be helpful here. Children can see the chart as they count, and the tens nature of the number system will be revealed as they count by 10's. The lesson might well be ended by having the pupils count by 2's and list on the board the 2's between 1 and 20. This will be an excellent readiness exercise for the work to follow.

Page 200

Aim: To associate the operation of multiplication with addition

Suggestions: Multiplication of whole numbers can be accomplished by addition. In fact, for countless centuries all computation which would today be classified as multiplication was done by addition. Pupils should understand this, and new work in multiplication should be introduced as addition. In this way the learner will realize how wonderful the multiplication operation is and how much easier it is to multiply than to add when equal groups are involved. *American Arithmetic, Grade 3* stresses the additive nature of multiplication by showing the sum of six 2's and suggesting that pupils add the column to find the answer. This is the discovery method, which leads quite normally to the building of a multiplication table. Suggest that every pupil build a squared table with 10 squares across and 10 squares down similar to the one on the next page. Then, as the pupil discovers the answer to six 2's, he writes it in the proper box in the table. He repeats the process with nine 2's, five 2's, and so on until the column headed "2" is completely filled (except for the 0 fact).

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5			10							
6			12							
7										
8										
9			18							

When, at a later date, the reverses of the 2's are discovered, they would appear in the row labeled "2"; and similarly for the 3's and their reverses. The building of the multiplication table serves many purposes:

(1) It provides a way for the pupil to discover for himself the multiplication facts.
(2) It helps the pupil to discover interesting relationships among the multiplication facts by seeing them in organized patterns.
(3) It reveals very clearly the additive nature of the multiplication system.
(4) It serves as a ready reference for a forgotten multiplication fact without requiring the child to show his lack of knowledge.

Notice that all references to multiplication on this page are in the additive form. For instance in ex. 6, the pupil reads, "Five 2's are . . ." This language is far more meaningful than "five times 2" and is recommended for the slow learner whenever new facts are introduced.

Key: **1.** 8, 10, 12, 14, 16, 18; 9; 18. **2.** 12. **3.** 12. **4.** 10 buttons; 10. **5.** 8; 8. **6.** 10; 12. **7.** 18; 16. **8.** 8; 6. **9.** 4; 14.

Page 201

Aim: To introduce special vocabulary words in connection with multiplication

Suggestions: The terms *multiplying*, *times*, and *multiplication fact* are used over and over again in arithmetic classes, but they are not frequently used by the eight-year-old child. For instance, *times* is used in many ways other than to express multiplication. The sign × will need discussion and explanation. Ex. 7, 8, and 9 reveal how nine 2's and so on are written in horizontal form by using the

× sign. Allow the pupils ample practice in writing multiplication facts in words and in numbers before going on to the work of the next page.

Key: **1.** 7 pairs; 14 shoes; 14. **5.** C; 18; 18. **6.** B; 8; 8; 8 × 2 = 16. **7.** 18, 18, 14. **8.** 10, 10, 16. **9.** 12, 12, 6.

Page 202

Aim: To teach how to write multiplication facts in vertical and horizontal forms

Suggestions: Multiplication facts, like addition facts, can be written in both vertical and horizontal forms. When written in horizontal form, a multiplication fact follows the pattern in which sentences are read and written, and hence is easiest for children to comprehend. Yet the vertical form should be strongly emphasized since most computation in multiplication is performed in this way.

Learning multiplication facts will be facilitated if the teacher is consistent in reading and writing them. When a fact such as $5 \times 2 = 10$ is written in horizontal form, it is agreed that the number on the left is the multiplier and the second number is the one that is repeated. Thus this fact should be read as "five 2's are 10" or "five times two equals 10," and not as "two 5's are 10" or "2 times 5 equals 10." This same fact when written in vertical form should appear as shown on the right and it should be read as indicated above. If the top number is read first, this language should be used: "2 multiplied by 5." It should be emphasized again that the 5 is the multiplier and not 2.

$$\begin{array}{r} 2 \\ \times\ 5 \\ \hline 10 \end{array}$$

The foregoing remarks should not be interpreted as a condemnation of the practice of emphasizing the reversals. It means simply that each fact must be read properly. Teaching the reversals within close proximity of each other is an essential feature of meaningful learning and emphasizes what mathematicians call the *commutative principle of multiplication*. This principle states that the product of two numbers is the same regardless of the order in which they are multiplied. Since $5 \times 2 = 10$ and $2 \times 5 = 10$ it is at once obvious that $5 \times 2 = 2 \times 5$. Stated algebraically with letters to represent any numbers, this property appears as $a \times b = b \times a$. While 5 groups of 2 buttons have a different meaning from 2 groups of 5 buttons, it is significant that the product is the same in each case. This property is not emphasized until pages 205 and 206, but is mentioned here for the benefit of the teacher.

It will be noted that multiplication of 2's is presented in sequential order in ex. 2 for the purpose of helping children see relationships among the various facts. Visualizing relationships among the multiplication facts is just as important in learning them as it was in the case of the addition and subtraction facts. Help the children discover number relationships by asking such questions as: "If you know that five 2's are 10, then how can you tell how much six 2's will be? four 2's?"

Workbook Reference: Arithmetic Workshop, Book 3, pages 67 and 68

Key: **3.** 4 × 2¢ = 8¢; 14¢; 16¢. **4.** 3 × 2¢ = 6¢; 10¢; 12¢. **5.** 16, 10, 2, 12, 8, 18, 4, 14, 6. **6.** 2, 8, 14, 4, 10, 16, 6, 12, 18. **7.** 4 × 2 = 8.

Page 203

Aim: To use the multiplication facts of the 2's in problem-solving situations

Suggestions: Notice that dolls are priced at $2 and the cookies are 2¢. Word problems often contain absurd figures. *One of the features of this textbook is the attempt to be accurate in stating word problems.* Children are continually meeting verbal situations presenting accurate data within their experiences. In ex. 6, it might be well to ask whether there are really sixteen slices of bread in a loaf. Many persons have little understanding of the quantitative nature of our daily living, and such a question would encourage some research at home to find the number of slices in a loaf. This might lead to another conclusion: "Not all loaves of bread have the same number of slices." The extension of word problems in the textbook to the daily life of the child is an excellent way to *make arithmetic live.*

Key: **1.** 3 × $2 = $6. **2.** 6 × 2¢ = 12¢. **3.** 7 × 2¢ = 14¢. **4.** 5 × 2¢ = 10¢. **5.** 9 × 2¢ = 18¢. **6.** 16; 8 × 2 = 16. **7.** 8; 4 × 2 = 8. **8.** $4; 2 × 2 = 4. **10.** 10, 6, 12. **11.** 12, 18, 16. **12.** 8, 14, 10. **13.** 4, 12, 14. **14.** 18, 16, 8.

Page 204

Aim: To show the relationship of addition facts to multiplication facts

Suggestions: *Do not state at this point* that the lesson deals with reverses (as this is considered on page 206). Emphasize only that the doubles are to be studied. Once again the additive nature of multiplication is emphasized. Each of the doubles is illustrated as an addition fact, and then the pupil is encouraged to see the fact as two times the number. Then the double is shown as a multiplication fact in horizontal form (ex. 3, 4, 5). Finally, in ex. 6, the facts are shown in

	0	1	2	3	4	5	6	7	8	9
0										
1			2							
2		2	4	6	8	10	12	14	16	18
3			6							
4			8							
5			10							
6			12							
7			14							
8			16							
9			18							

vertical form. *Point out to the pupils* the upward nature of the vertical form, that 2 × 1 is written with the 2 below the 1. Be sure to remind the pupils to record the multiplication facts on their individual multiplication tables which they started when the multiplication facts of 2's were discovered. (See the suggestions for teaching page 200.) Be sure that the children enter these facts correctly. For instance, 2 × 5 is entered by finding the number 2 in the left margin and going into the table until the column 5 is reached. 2 × 8 is entered on the same line as 2 × 5, but in the 8's column. When all the facts taught on page 204 have been entered, it will appear as shown on the opposite page.

Workbook Reference: Arithmetic Workshop, Book 3, page 68

Key: **1.** D shows two 5's. **2.** $2 \times 1 = 2$, $2 \times 2 = 4$, $2 \times 3 = 6$, $2 \times 4 = 8$, $2 \times 5 = 10$, $2 \times 6 = 12$, $2 \times 7 = 14$, $2 \times 8 = 16$, $2 \times 9 = 18$. **3.** 10, 18, 4. **4.** 16, 12, 8. **5.** 6, 2, 14.

Page 205

Aim: To present the multiplication facts of the 2's and their reverses

Suggestions: Extend the practice work in ex. 8–12 to develop all the 2's in the manner of these five. Stress both the horizontal and the vertical presentation of these facts. See the suggestions for teaching page 202.

Key: **1.** 12 eggs. **2.** 12. **3.** 12. **5.** 8; $2 \times 4 = 8$ and $4 \times 2 = 8$. **6.** 6; $2 \times 3 = 6$ and $3 \times 2 = 6$. **7.** $2 \times 7 = 14$ and $7 \times 2 = 14$; $2 \times 5 = 10$ and $5 \times 2 = 10$; $2 \times 9 = 18$ and $9 \times 2 = 18$. **8.** 6, 6; 10. **9.** 18, 18; 8. **10.** 10, 10; 12. **11.** 14, 14; 18. **12.** 16, 16; 10.

Page 206

Aim: To encourage pupils to generalize about the commutative principle

Suggestions: Use the closed-book approach to this lesson. Place on the board the addition facts:

$$2 + 3 = 5 \quad \text{and} \quad 3 + 2 = 5$$

Ask the pupils if it is possible to know the answer to $3 + 6$ if we know that $6 + 3 = 9$. They will see that reversing addition facts produces the same answer. Point out that multiplication operates similarly. If we know that $2 \times 6 = 12$, we also know that $6 \times 2 = 12$. Have the pupils refer to their own multiplication tables to check this statement. Extend the concept to all multiplication facts, and urge the children to keep watching to find out if this rule always works. Now have them open their books and work the exercises.

Key: **2.** Yes. **3.** 7 × 2; 14. **5.** 12; 12. **6.** 3, 9. **7.** 7, 2. **8.** 2, 8.

Page 207

Aim: To maintain skills in addition and subtraction

Suggestion: The work of this page should be completed by most pupils. The faster ones may be able to add ex. 1–3 horizontally as well as vertically. Any horizontal addition will probably be with pencil and paper, yet a very advanced pupil may be able to complete the work mentally.

Workbook Reference: Arithmetic Workshop, Book 3, page 73

Key: **1.** 161, 157, 180. **2.** 255, 208, 206. **3.** 199, 120, 187. **4.** 34¢ + 32¢ + 85¢ = 151¢ or $1.51. **5.** 36¢ + 82¢ + 13¢ = 131¢ or $1.31. **6.** 141, 101, 967, 910, 829, 728. **7.** 152, 173, 801, 630, 930, 961. **8.** 45, 69, 475, 580, 361, 156; 14, 17, 133, 124, 132, 435. **9.** 382 eggs − 360 eggs = 22 eggs; more than 1 dozen. **10.** 29, 59, 134, 289, 8, 98. **11.** 7, 61, 488, 12, 148, 79.

Pages 208–209

Aim: To provide mental arithmetic work in multiplication

Suggestion: These exercises and problems are to be done orally. Encourage the children to write only examples or facts on which they hesitate.

Key: Page 208 **1.** 6 × 2¢ = 12¢. **2.** 4 × $2 = $8. **3.** 2 × $6 = $12. **4.** 3 × 2¢ = 6¢; 4 × 2¢ = 8¢; 6 × 2¢ = 12¢; 2 × 5¢ = 10¢; 2 × 3¢ = 6¢; 2 × 7¢ = 14¢; 2 × 6¢ = 12¢; 2 × 9¢ = 18¢. **5.** 6, 16, 4. **6.** 10, 18, 12. **7.** 2, 14, 8. **8.** (Same answers as for ex. 5–7.) **9.** 18, 16, 10, 18, 14, 4, 6, 2, 8. **10.** 4, 12, 8, 12, 16, 2, 14, 6, 10. **11.** 19, 17, 11, 19, 15, 5, 7, 3, 9; 5, 13, 9, 13, 17, 3, 15, 7, 11.

Page 209 **1.** 8 × 2¢ = 16¢. **2.** Ten, four, eight, twelve, six. **3.** 9 hundreds, 8 tens, 5 ones; 7 hundreds, 0 tens, 0 ones; 1 thousand, 5 hundreds, 8 tens, 6 ones; 3 thousands, 8 hundreds, 0 tens, 0 ones; 4 thousands, 7 hundreds, 0 tens, 3 ones; 2 thousands, 0 hundreds, 0 tens, 9 ones. **4.** 10, 2. **5.** 12, 4. **6.** 100, 12. **7.** 20, 5. **8.** 17, 3, 3, 14, 15, 4, 12. **9.** 13, 11, 7, 9, 7, 14, 6. **10.** 4¢ + 3¢ + 7¢ + 5¢ = 19¢. **11.** 12, 6, 16, 4, 8, 18, 2, 16, 12. **12.** 2, 10, 14, 18, 6, 10, 14, 16, 8. **13.** 13, 7, 17, 5, 9, 19, 3, 17, 13; 3, 11, 15, 19, 7, 11, 15, 17, 9.

Page 210

Aim: To teach the multiplication of 2-figure numbers by 2 without carrying

Suggestions: Once again the additive nature of multiplication is illustrated. Notice that the example shows how the answer can be found *by adding;* then it is explained how the same problem can be worked by multiplication. It is well to stress at this point the place value of the figures in the multiplicand. A good way to do this is to show the multiplication performed in other ways, such as the following:

$$\begin{array}{r} 2\text{ tens} + 4\text{ ones} \\ \times 2 \\ \hline 4\text{ tens} + 8\text{ ones} \end{array} \qquad \begin{array}{r} 20+4 \\ \times 2 \\ \hline 40+8 \end{array} \qquad \begin{array}{r} 24 \\ \times\ 2 \\ \hline 8 \\ 40 \\ \hline 48 \end{array}$$

Some teachers require that simple multiplication examples like those on this page be checked by addition. For example, the multiplication above can be checked by adding 24 and 24.

Key: **2.** 46, 28, 62, 24, 68, 42, 846, 286.

Page 211

Aim: To provide further practice in multiplying by 2

Suggestions: Encourage the pupils to explain what they are doing. Keep stressing the additive nature of multiplication by encouraging them to say "two 1's" rather than "2 × 1."

Workbook Reference: Arithmetic Workshop, Book 3, page 70

Key: **2.** 182, 124, 108, 82, 26, 268, 448. **3.** 104, 166, 184, 146, 68, 684, 462. **4.** 162, 148, 106, 164, 42, 666, 826. **5.** 188, 122, 168, 186, 86, 1268, 1464. **6.** 64, 128, 84, 142, 126, 248, 446.

Page 212

Aim: To develop a generalization about the 1's in multiplication

Suggestions: If the additive phrasing of these multiplication facts is used, there will be no trouble in securing excellent pupil mastery of this understanding. For what person would debate that one 3 is 3 and one 8 is 8; or in reverse form that three 1's are 3 and eight 1's are 8? The nature of the 1's will be obvious, and little attention will be paid to these facts after this lesson. Notice that 17 multiplication facts are taught on this page — all by generalization! Remind the pupil to enter these facts on his multiplication table.

Key: **1.** 2 lollipops; 2. **2.** 4 pencils; 4. **3.** 6¢; 6. **4.** 3, 5, 8. **5.** 7, 9, 6. **7.** 66, 22, 99, 55, 24, 33, 85, 44.

Page 213

Aim: To teach the multiplication of 2-figure and 3-figure numbers by 1-figure numbers without carrying

Suggestion: The more advanced pupils will be able to do most of this work mentally and just write the answers.

Key: **3.** 84, 88, 122, 88, 462, 428, 888. **4.** 66, 28, 44, 36, 415, 228, 826. **5.** 86, 77, 63, 44, 666, 642, 448. **6.** 99, 86, 24, 105, 226, 486, 366.

Pages 214–215

Aim: To extend the work of the previous pages to dollars and cents

Suggestions: This type of example is very common in adult life as much of our daily figuring is with dollars and cents. If the children have difficulty in placing the decimal point, be sure to refer them to the additive way of solving the example. Some will enjoy using their play money to find the answers to the problems.

Key: Page 214 **2.** Think, "4 × \$1 = \$4," and write 4 in dollars place; put in the \$ sign and decimal point. **3.** 2 × \$.34 = \$.68. **4.** 3 × \$1.32 = \$3.96. **5.** 2 × \$3.12 = \$6.24. **6.** 2 × \$.23 = \$.46.

Page 215 **7.** 2 × \$1.21 = \$2.42; \$3.63; \$4.84. **8.** \$.42, \$1.08, \$6.28, \$2.86, \$8.22. **9.** \$.66, \$.36, \$6.63, \$8.42, \$6.84. **10.** \$1.26, \$1.68, \$2.46, \$8.88, \$8.68. **11.** \$1.62, \$1.84, \$8.46, \$7.77, \$8.48.

Page 216

Aim: To make the process of multiplication meaningful in connection with problem solving

Suggestion: Two important multiplication thought patterns are developed on this page. Most pupils will have no difficulty in understanding what to do in these word problems. If some prefer to add rather than multiply, accept that process. However, point out that the work could also be done by multiplication, as they are adding equal groups.

Key: **1.** 2 × 24 marbles = 48 marbles. **2.** 4 × 12 cups = 48 cups. **3.** 2 × 34 cookies = 68 cookies. **4.** 2 × 144 sheets = 288 sheets. **5.** 2 × 43¢ = 86¢. **6.** 2 × 32¢ = 64¢. **7.** 4 × 22¢ = 88¢. **8.** 2 × 23¢ = 46¢.

Page 217

Aim: To present some problems to be done orally

Suggestion: Be sure that the children do not use pencil and paper for this page. Keep the exercise oral in every respect.

Key: **1.** Multiply, 6¢. **2.** Add, 12¢. **3.** Subtract, 15¢. **4.** Subtract, 8 boys. **5.** Add, 17¢. **6.** Subtract, 2¢. **7.** Multiply, 14 glasses. **8.** Add, 13¢. **9.** Multiply, 10¢. **10.** Subtract, 6¢. **11.** Multiply, 12¢. **12.** Subtract, 7 eggs. **13.** Subtract, 5 years.

Page 218

Aim: To maintain subtraction and multiplication skills previously taught

Key: **1.** \$1.00 − \$.72 = \$.28. **2.** \$5.00 − \$4.39 = \$.61. **3.** \$1.34 + \$1.34 = \$2.68. **4.** 386, 854, 477, 423, 500, 605. **5.** 863, 900, 916, 794, 765, 500. **6.** 252, 245, 664, 223, 96, 186. **7.** 134, 44, 190, 188, 355, 93. **8.** \$.68, \$.84, \$1.08, \$6.28, \$2.64, \$8.26.

Pages 219–220

Aim: To teach the multiplication facts for the 3's

Suggestions: Begin this work by stressing the additive nature of the multiplication process. The child can *discover* all these facts by expressing them as examples of column addition (see the illustration at the right on page 219). Urge the pupils to make similar presentations for the facts at the bottom of the page. Encourage them to say "five 3's, two 3's, eight 3's" and so on so that the additive nature of these facts becomes self-evident. Proceed from the additive approach to the horizontal algorism (5 × 3, 2 × 3, and so on), to the vertical algorism (as shown in ex. 7 on page 220). Once again stress the upward nature of this work. As soon as all facts are learned, have the pupils enter them on their individual multiplication tables which they built in connection with the work on page 200.

Key: Page 219 **1.** 12; 12. **4.** $3 \times 3 = 9$; $6 \times 3 = 18$; $8 \times 3 = 24$. **5.** 15; 21; 27. **6.** 15, 6, 24. **7.** 21, 27, 12. **8.** 3, 9, 18.

Page 220 **1.** D. **2.** B. **3.** A. $3 \times 3 = 9$; C. $6 \times 3 = 18$; E. $9 \times 3 = 27$; F. $7 \times 3 = 21$; B. $8 \times 3 = 24$, $3 \times 8 = 24$; C. $3 \times 6 = 18$; D. $5 \times 3 = 15$, $3 \times 5 = 15$; E. $3 \times 9 = 27$; F. $3 \times 7 = 21$. **4.** 21, 18, 12. **5.** 9, 6, 27. **6.** 24, 3, 15. **8.** $8 \times 3¢ = 24¢$; 15¢; 6¢; 27¢. **9.** $4 \times 3¢ = 12¢$; 18¢. **10.** 6×3 buttons = 18 buttons; 15 buttons; 12 buttons.

Page 221

Aim: To teach the reverses of the 3's

Suggestions: A quick reference to the reverses of the 2's (page 205) will assist pupils in making the quick generalization concerning the 3's. Stress both the horizontal and the vertical presentation. Have the pupils enter these facts on their individual multiplication charts.

Workbook Reference: Arithmetic Workshop, Book 3, pages 74 and 88

Key: **1.** 15 balls. **2.** 15; 15; yes. **4.** 21, 21, 18. **5.** 27, 27, 12. **6.** 24, 24, 15.

Pages 222–223

Aim: To provide further practice with the 3's

Suggestions: The work on page 222 is primarily oral in nature and can be done in the first few minutes of the class period. Ex. 1–8 of page 223 are also to be included in this oral warm-up prior to the written work which begins in ex. 9. Ex. 9–11 are similar to those on pages 210 and 211.

Workbook Reference: Arithmetic Workshop, Book 3, pages 87, 88, and 89

Key: Page 222 **1.** 6; 15; 27. **2.** 21¢; 12¢; 18¢; 9¢; 24¢. **3.** 7 days; 21 days. **4.** $4 \times 3 = 12$ (children). **5.** 21; 21. **6.** Turn the numbers around. **7.** $5 \times 3 = 15$ (cents). **8.** 12, 18, 9, 24, 3. **9.** 6, 24, 21, 6, 15. **10.** 27, 21, 15, 18, 27. **11.** 18, 12, 3, 27, 9, 2, 21, 3, 6. **12.** 12, 27, 15, 18, 24, 21, 15, 6, 24.

Page 223 **1.** $3 \times 7 = 21$ (eggs). **2.** $3 \times 8 = 24$ (sandwiches). **3.** $3 \times 3 = 9$ (carrots); 12 carrots. **4.** $6 \times 3 = 18$ (rolls). **5.** $2 \times \$3 = \$6$. **6.** 21, 12, 6, 15, 24, 3, 18, 6, 9. **7.** 12, 18, 27, 21, 12, 24, 15, 3, 27. **8.** Adding 1: 22, 13, 7, 16, 25, 4, 19, 7, 10; adding 2: 23, 14, 8, 17, 26, 5, 20, 8, 11. **9.** 39, 186, 96, 249, 128, 639, 963. **10.** 213, 69, 155, 66, 123, 396, 633. **11.** 189, 124, 68, 129, 217, 999, 693.

Page 224

Aim: To introduce carrying in multiplication

Suggestions: Relate carrying in multiplication to carrying in addition by showing how multiplication examples could be solved by changing them to addition examples. For example, show how the problem at the top of page 224 could be solved in these ways:

2 dimes + 4 pennies	2 4	2 dimes + 4 pennies	24	24
2 dimes + 4 pennies	2 4	× 3	×3	×3
+ 2 dimes + 4 pennies	+ 2 4	6 dimes + 12 pennies	12	72
6 dimes + 12 pennies	7 2	or	60	
or		7 dimes + 2 pennies	72	
7 dimes + 2 pennies				

Since carrying in multiplication is a mental operation, it would be a good idea to provide supplementary oral and written practice of the following kind: $(2 \times 7) + 1 = \ldots$ $(3 \times 6) + 2 = \ldots$ $(3 \times 8) + 2 = \ldots$ Explain to the pupils that the symbols ( ) simply show that the multiplication should be done first and then the addition. It is not necessary to call the symbols ( ) parentheses at this time. If the symbols are not used, as in the case of $2 \times 7 + 1 = \ldots$, some children may add first and multiply secondly. This would, of course, result in a different answer and it would then be necessary to tell the children that multiplication takes precedence over addition, and this becomes rather involved. Another good way to avoid this situation, besides using parentheses, is to state or write examples in this form: six 2's + 1 = . . . or 8 threes + 2 = ...

Workbook Reference: Arithmetic Workshop, Book 3, pages 71 and 72

Key: **2.** 2 × 98¢ each = 196¢ or $1.96. **3.** 75, 48, 96, 45, 150, 92, 78. **4.** 134, 105, 138, 58, 170, 282, 70. **5.** 225, 192, 74, 162, 228, 174, 255. **6.** 116, 42, 288, 132, 178, 195, 190. **7.** 108, 56, 118, 78, 98, 34, 102. **8.** 36, 135, 192, 38, 222, 165, 52.

Page 225

Aim: To maintain the mental arithmetic skills previously learned

Suggestion: All the work on this page deals with basic addition, subtraction, and multiplication facts with the exception of ex. 1 and 2, which review the meanings of *thirds* and *fourths*. Have pupils add other numbers to the products in ex. 13–17.

Key: **1.** Three. **2.** Four. **3.** 7 cents. **4.** 3 × 8¢ = 24¢. **5.** 4, 12, 8, 1, 14. **6.** 12, 6, 10, 14, 8. **7.** 10, 3, 5, 13, 17. **8.** 12, 14, 4, 15, 6. **9.** 4, 13, 18, 13, 3. **10.** 40, 13. **11.** 35, 15. **12.** 75, 35. **13.** 21, 22; 27, 28; 18, 19; 24, 25; 12, 13. **14.** 12, 13; 12, 13; 8, 9; 18, 19; 10, 11. **15.** 15, 16; 6, 7; 18, 19; 5, 6; 27, 28. **16.** 9, 10; 24, 25; 14, 15; 9, 10; 18, 19. **17.** 21, 22; 6, 7; 14, 15; 16, 17; 15, 16. **18.** Adding 2 to each answer: 23, 29, 20, 26, 14; 14, 14, 10, 20, 12; 17, 8, 20, 7, 29; 11, 26, 16, 11, 20; 23, 8, 16, 18, 17.

Page 226

Aim: To develop a series of word problems centering around a book store

Suggestions: Some children have frequent experiences in buying books. Begin the lesson by having such pupils tell of a recent experience. This might lead to a discussion of what schoolbooks cost. Someone might suggest changing the toy store (developed in connection with the work on pages 178–180) into a book store. Several pupils might volunteer to lend the store some books for sale, and the pricing of these books would provide the opportunity for some research. After interest is fully aroused in these problems, the pupils should experience no difficulty in solving them.

Key: **1.** \$2.50 + \$1.95 = \$4.45. **2.** \$5.00 − \$4.45 = \$.55; \$4.45, \$4.50, \$5.00. **3.** \$2.95 − \$2.50 = \$.45. **4.** 3 × \$1.22 = \$3.66. **5.** 7 × 3 = 21 (days). **6.** \$2.00 − \$1.35 = \$.65.

Page 227

Aim: To maintain addition skills

Suggestions: The work on this page is a thorough and comprehensive review of all the steps in addition taught in this book. Notice that the problems include carrying, zeros, ragged columns, 2-figure, and 3-figure addends. Also, ex. 8 and 9 provide further practice in adding by endings. Pupils who attain a high degree of accuracy in these examples will find little difficulty with further work in addition.

Key: **1.** 90, 107, 106, 137, 118, 116, 169, 200. **2.** 105, 148, 116, 131, 192, 222, 113, 195. **3.** 28 + 42 + 36 = 106; 48 + 16 + 59 = 123. **4.** 75¢ + 45¢ + 9¢ + 35¢ = 164¢ or \$1.64. **5.** 18, 138, 165. **6.** 20, 142, 122. **7.** 21, 152, 200. **8.** 54, 62, 29, 43, 90, 25, 71, 77. **9.** 57, 65, 32, 46, 93, 28, 74, 80; 55, 63, 30, 44, 91, 26, 72, 78. **10.** 555, 537, 533, 891, 622, 414. **11.** 500, 864, 300, 816, 427, 720. **12.** 686, 947, 730, 861, 712, 706.

Page 228

Aim: To extend linear measure to include the *yard*

Suggestions: The pupils have already had instruction in the use of the foot ruler and are familiar with the markings that indicate inches and parts of an inch. (See pages 132–133 of the text.) They should now be shown a yardstick together with a foot ruler so that they can see that 3 feet make 1 yard. The inch markings on the yardstick should be called to the pupils' attention so that they will see that 36 inches make 1 yard. To teach work in linear measurement successfully, you must give the pupils actual experience in measuring a variety of objects. Such measurements will include those that can easily be made in the classroom, such as measuring the length and width of a table, the length and width of the chalkboard, the height of pupils, and so on. Additional development of this topic may be planned by using a cloth tape (72 inches long) and tacking it to the wall of the room. Allow the bottom of the tape just to touch the floor. One by one the children then go to the tape and place their backs to the wall. A classmate holds a ruler over the head of the pupil being measured, who then turns around and reads his height. This height in inches may then be compared with the length of the yardstick. Before the work on this page is completed, provide an opportunity for the pupils to estimate various distances involving yards. For instance, how many yards wide is the classroom? How many yards are there between the workbench in the rear of the room and your desk? How many yards wide is the paved section of the playground?

Key: **1.** 36 inches + 8 inches = 44 inches. **2.** 3 feet. **3.** 3 feet; 12 inches; 3 × 12 = 36 (inches); yes. **6.** 1 yard. **7.** 5 yards. **8.** 11 feet. **9.** 15 inches. **10.** 2 yards. **11.** 1 foot.

Page 229

Aim: To teach the 0 facts in multiplication

Suggestions: For many years, the zeros in multiplication have caused endless trouble. However, if a pupil knows what multiplication really is (a short form of adding equal groups) and if he understands place value, the 0 facts in multiplication can be taught by generalization. Such is the approach taken on this page. Notice that three 0's are discussed in ex. 2. It is quite obvious that three 0's or five 0's or eight 0's or any number of 0's will *still add up to nothing!* In contrast to this, ex. 6 develops the idea of no 8's, no 1's, no 7's, no 3's. These facts, however, never appear in multiplication examples. For instance, when the multiplier is 20 and the multiplicand is 26, the first multiplication takes place in tens place as there are no ones in the multiplier. Thus, you see, a teaching of the reversal of the zero facts is included at this point only to complete the commutative principle. Little attention is given on page 229 to the place value of zero. However, for the sake of completeness in generalizing, all zero facts are included. Remind the pupils to enter these facts on their multiplication charts.

Workbook Reference: Arithmetic Workshop, Book 3, page 74 (left)

Key: **1.** 6; 6. **2.** 0. **3.** 0; 0. **4.** 0; 0; 0; 0. **6.** 0; 0; 0; 0. **7.** 1 × 0 = 0, 7 × 0 = 0, 8 × 0 = 0, 0 × 2 = 0, 0 × 4 = 0, 0 × 5 = 0, 0 × 9 = 0.

Pages 230–231

Aim: To extend multiplication to include 3-figure numbers and zero difficulties

Suggestions: Supplement the explanation at the top of page 230 by showing how to multiply in other ways, such as:

$$\begin{array}{r} 2 \text{ dollars} + 0 \text{ dimes} + 9 \text{ pennies} \\ \times\ 3 \\ \hline 6 \text{ dollars} + 0 \text{ dimes} + 27 \text{ pennies} \\ \text{or} \\ 6 \text{ dollars} + 2 \text{ dimes} + 7 \text{ pennies} \end{array} \qquad \begin{array}{r} 400 + 30 + 8 \\ \times\ 2 \\ \hline 800 + 60 + 16 \\ \text{or} \\ 800 + 70 + 6 \end{array} \qquad \begin{array}{r} 438 \\ \times 2 \\ \hline 16 \\ 60 \\ 800 \\ \hline 876 \end{array} \qquad \begin{array}{r} 438 \\ \times 2 \\ \hline 876 \end{array}$$

If children have a good understanding of place value, they are not likely to make the senseless mistakes they often would otherwise. Most of the examples on this page require carrying in addition. However, there is a new step in the examples which have zeros in the multiplicand. Most of these zeros occur as hidden zeros (such as in the number 107). Encourage the pupils to discuss examples with zeros by saying (as in the fifth example in ex. 3), "Three 7's are 21, write the 1 and carry the 2 tens; three 0's are 0; carry the 2 and write 2; three 1's are 3." Since some children need extra practice on this type of example, many teachers provide chalkboard examples illustrating the hidden zero difficulty. A check of these examples can be made either by doing the work over again, covering up the first answer with a slip of paper, or by addition.

Key: Page 230 **2.** 3 × \$1.28 = \$3.84. **3.** 201, 174, 207, \$1.44, 321, 565, \$9.21. **4.** 237, 104, 204, \$.87, 896, 327, \$6.78. **5.** 177, 192, 258, \$2.31, 824, 354, \$6.24. **6.** 117, 156, 141, \$2.64, 721, 418, \$8.96. **7.** 84, 138, 91, \$1.84, 954, 678, \$7.91. **8.** 161, 117, 297, \$1.94, 915, 918, \$3.24.

Page 231 **1.** 218, 657, 372, 294, 1065, 924. **2.** 654, 416, 278, 1421, 1251, 872. **3.** 3 × 48 beads = 144 beads. **4.** 3 × \$1.25 = \$3.75. **5.** 3 × 225 tickets = 675 tickets. **6.** 5 × 112 bottles = 560 bottles. **7.** 3 × 36 cookies = 108 cookies. **8.** 2 × 135 miles = 270 miles. **9.** 68, 183, 270, 176, 2100, 327, 480. **10.** 140, 234, 112, 87, 609, 490, 936.

Pages 232–233

Aim: To reteach calendar reading

Suggestions: If the class has been maintaining a room calendar, as suggested in connection with pages 108–109, these exercises will be very easy. No new ideas are presented, but the pupils are directed to observe that not all months have the same number of days. There will be some children who will want to recite the "30 days has September" poem. Others may indicate that it is easy to tell the number of days in any month by looking at the knuckles of your two hands. One pupil might demonstrate by placing his two clenched fists together with the thumbs folded under. The first knuckle on the left hand represents January; the "valley" between the first knuckle and the second knuckle, February; the next knuckle, March; and so on. Each "knuckle month" has 31 days, every "valley month" except February has 30 days. Where the two fists come together, there are two consecutive "knuckle months," which represent July and August. Also, the pupils will have the opportunity to correlate their library visits with calendar work by determining the number of days elapsed between given dates. Work of this type should be done directly with the calendar; have the pupils count out the days or weeks.

Workbook Reference: Arithmetic Workshop, Book 3, page 41

Key: Page 232 **1.** 12 months; January; December. **2.** 31 days; Thursday; Saturday. **5.** Tuesday, Sunday, Wednesday, Friday.

Page 233 **1.** 31, 28 or 29, 30, 31, 30. **2.** January, March, May, July, August, October, December; no. **3.** April, June, September, November; yes, February. **4.** December 25. **5.** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday; 7 days, 14 days, 21 days. **6.** June 14; add 7 + 7; June 21, June 28. **7.** July 11, July 18, July 25. **8.** Five. **9.** October 19. **10.** January 29, July 21, August 27, May 22.

Page 234

Aim: To extend subtraction concepts as they occur in problem-solving situations

Suggestions: The two new generalizations at the top of the page are very important in helping children estimate answers. It is common for pupils to give ridiculous answers to problem-solving situations. The cause of this faulty reasoning is that pupils do not sense that the difference in subtraction must always be less than the minuend and that the sum in addition must be greater than any addend. This page is devoted to subtraction concepts. Also, it includes the zero difficulty and reaffirms what the pupils learned on page 85 about zero facts in subtraction.

Key: **1.** 51 inches − 48 inches = 3 inches. **2.** 30 pieces − 12 pieces = 18 pieces. **3.** 35¢ − 28¢ = 7¢. **4.** 15 examples − 9 examples = 6 examples. **5.** 12 tickets − 3 tickets = 9 tickets. **6.** 12 − 5 = 7 (black rabbits). **7.** 19 rabbits − 12 rabbits = 7 rabbits. **8.** 50¢ − 29¢ = 21¢; yes.

Page 235

Aim: To present to the pupils the basic subtraction concepts found in problem-solving situations

Suggestions: All the major subtraction concepts which can arise in problem-solving situations are included in the list at the top of the page. This list is presented for summary purposes only and *is not to be memorized*. These concepts arise from a basic understanding of the problem-solving situation and should not be learned merely by repetition. The word problems at the bottom of the page provide practice in using these concepts in everyday situations.

Key: **1.** 60 cookies − 24 cookies = 36 cookies. **2.** 30¢ + 15¢ = 45¢. **3.** 3 × $1.20 = $3.60. **4.** $1.00 − $.39 = $.61; 39, 40, 50, $1.00. **5.** 3 × 7 = 21 (glasses). **6.** 2 × 144 oranges = 288 oranges.

Page 236

Aim: To maintain skill in addition, subtraction, and multiplication

Suggestions: Ex. 1, 2, 8, and 9 may be done orally. The more advanced pupils may wish to attempt ex. 10 and 11 on the same basis. Make every effort to encourage the children to do the work mentally, but the average pupils should not be expected to achieve this goal.

Workbook Reference: Arithmetic Workshop, Book 3, page 93

Key: **1.** 19, 22, 20, 21, 18, 20, 28, 19, 22. **2.** 23, 20, 26, 28, 21, 24, 21, 19, 19. **3.** 461, 29, 135. **4.** 170, 587, 107. **5.** 144, 8, 165. **6.** 77, 332, 111. **7.** 646, 900, 208. **8.** 57, 70, 41, 94, 23, 82, 29, 66; 56, 69, 40, 93, 22, 81, 28, 65; 58, 71, 42, 95, 24, 83, 30, 67. **9.** 39, 52, 23, 76, 5, 64, 11, 48; 44, 57, 28, 81, 10, 69, 16, 53. **10.** 96, 112, 249, 78, 438, 492. **11.** 42, 237, 146, 72, 824, 315.

Page 237

Aim: To present a multiple-choice objective test

Suggestions: This is the third type of objective test used so far in Grade 3. The first type was a True-False test; the second was a completion test. The basic objective on this page is to teach pupils how to take such a test. The items are relatively simple and serve as a means toward the basic objective *rather than as a comprehensive test.*

Key: **1.** April. **2.** 24 inches. **3.** 12 inches. **4.** 4 quarters. **5.** 4 pints. **6.** 18 inches. **7.** 12 eggs. **8.** 19 inches. **9.** Half dollar. **10.** XII. **11.** $\frac{1}{2}$ pie. **12.** 2 quarts.

Page 238

Aim: To review and test the accomplishment of some of the major aims

Suggestion: The work on this page tests accomplishment of seven of the aims listed at the beginning of Chapter 6 of this Guide, as follows:

Chapter Review	*Aim Number*
Ex. 1–3	3
Ex. 4–5	2
Ex. 6–8	8 and 2
Ex. 9–12	1 and 10
Ex. 13–16	4 and 5

Aim 6 is thoroughly tested in the diagnostic review on page 240, and aim 7 in the Problem Test on page 239.

Key: **1.** 15, 16; 18, 19; 21, 22; 8, 9; 27, 28. **2.** 16, 17; 18, 19; 12, 13; 9, 10; 0, 1. **3.** 12, 13; 0, 1; 4, 5; 27, 28; 14, 15. **4.** 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50. **5.** 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60. **6.** 18, 18; 8. **7.** 18, 18; 21. **8.** 0, 0; 24. **9.** 3 × 12 = 36; 4 × 12 = 48. **10.** 12 × 3 = 36 × 2 = 72; 12 × 3 = 36 × 3 = 108. **12.** June 18. **13.** 36, 108, 87, 812, 675, 324. **14.** 162, 140, 178, 565, 480, 657. **15.** 294, 264, 231, 480, 721, 660. **16.** 225, 152, 192, 834, 942, 852.

Page 239

Aim: To present Problem Test 6

Suggestion: Five of the ten problems on this page deal with multiplication thought patterns, and the remaining five review previously taught addition and subtraction thought patterns.

Key: **1.** 2 × 135 stamps = 270 stamps. **2.** 2 × \$.75 = \$1.50. **3.** \$.65 + \$1.25 = \$1.90. **4.** 300 stamps − 270 stamps = 30 stamps. **5.** \$1.50 + \$1.49 = \$2.99. **6.** \$5.00 − \$2.99 = \$2.01. **7.** 25 baskets − 4 baskets = 21 baskets. **8.** 8 × 2¢ = 16¢. **9.** 3 × \$.85 = \$2.55. **10.** 3 × 27 cookies = 81 cookies.

Page 240

Aims: To provide a diagnostic test of the multiplication taught in Chapter 6; to provide extra practice for those pupils who do not meet satisfactory standards of excellence

Suggestion: The work in multiplication unfolds in orderly sequence on this page, beginning with the basic facts and proceeding to multiplication examples with and without carrying, and finally to examples involving money.

Key: **1.** 12, 12. **2.** 4, 4. **3.** 24, 24. **4.** 0, 0. **5.** 64, 82, 166, 628, 462. **6.** 66, 105, 26, 844, 363. **7.** \$.48, \$.77, \$.66, \$1.28, \$1.84. **8.** 69, 123, 155, 369, 663. **9.** 50, 72, 78, 48, 75. **10.** 81, 225, 184, 621, 384. **11.** \$2.04, \$1.11, \$.87, \$.91, \$.57.

Chapter 7

Aims of Chapter 7. The major aims of Chapter 7 are to:

1. Maintain the skills of addition, subtraction, multiplication, and division taught in previous chapters.
2. Teach that division is the reverse operation of multiplication and that all division facts can be discovered from their corresponding multiplication facts.
3. Teach the division facts of 2's, 3's, and 0's.
4. Teach how to find $\frac{1}{2}$ and $\frac{1}{3}$ of a number.
5. Teach division of 2-figure and 3-figure numbers by 2 and 3, with no remainders.
6. Introduce simple division concepts in word-problem situations.
7. Reteach *before* and *after* the hour, and teach A.M. and P.M.
8. Extend work in measures to include *gallon, ounce, pound,* $\frac{1}{2}$ *lb.,* 60 *minutes to the hour.*
9. Enlarge the arithmetic vocabulary to include technical words denoting division and the division process.

Pages 241–242

Aim: To develop a readiness for the division facts of 2

Suggestions: Summer will soon be here, and all children dream about the experiences of summer camping. *American Arithmetic, Grade 3* uses this setting to develop a knowledge of the division facts of 2's. The two problems on page 241 are typical of those arising from camping experiences, and both problems end with the question: "How many 2's make . . .?" This question is easily associated with the multiplication story of: ". . . 2's make . . ." Page 242 continues the same thought pattern which will predominate throughout the learning of the division facts; namely, that all division facts can be learned by associating them with the corresponding multiplication facts. This idea, you will observe, is in direct contrast with the development of the multiplication facts, which leaned heavily for their discovery upon the relationship between addition and multiplication. However, you may desire to associate division with subtraction; and in its development of the work for the next page, the Guide will show the pattern that may be followed.

Key: Page 241 **1.** 7 tents; 7 tents; 7. **2.** 9 tents; 9 tents; 9.
Page 242 **1.** Six groups; 6. **2.** Seven groups; 7; 7. **3.** Eight groups; 8. **4.** 6, 3. **5.** 8, 4. **6.** 16, 8. **7.** 5. **8.** 18, 9. **9.** 4, 2.

Page 243

Aim: To teach the division vocabulary terms *divided by, dividing, division fact,* and the division sign

Suggestions: Turn back to the word problems on pages 241–242 and reword them for the pupils. For instance, in problem 1 say, "14 boys divided into groups of 2

make —— groups"; "18 boys divided into groups of 2 make —— groups," and so on. Also at this point it is relatively easy to develop the understanding that division is a short form of subtraction. Do this by using different words to express the division thought and by having pupils subtract and count the number of times the divisor can be subtracted from the dividend. This will give the quotient. For instance, in the division fact at the right, suggest that the pupil see how many times 2 can be subtracted from 8:
Count the number of subtraction signs. Since you see four, there are four 2's in 8. Every division fact can be verified in this manner. This understanding is basic to an appreciation of the work in division to be developed in Grade 4. It is therefore suggested that all work in division be associated with multiplication and with subtraction, but in the interest of clarity the textbook makes only the multiplication association. The teacher is advised to continue the association by subtraction until every pupil is thoroughly grounded in the idea that division is a *short way of subtracting equal groups.* The size of the equal groups is represented by the number outside the division box (the divisor). This is the measurement concept of division and is the easier of the two division concepts to grasp. (The other concept is the partition concept of division, first discussed on page 247.)

$$\begin{array}{r} 4 \\ 2\overline{)8} \end{array}$$

$$\begin{array}{r} 8 \\ -2 \\ \hline 6 \\ -2 \\ \hline 4 \\ -2 \\ \hline 2 \\ -2 \\ \hline 0 \end{array}$$

Workbook Reference: Arithmetic Workshop, Book 3, page 95

Key: **1.** 6 groups; 6. **2.** Yes. **3.** 8; yes. **7.** "How many 2's in 8?"; "How many 2's in 14?" **8.** 6; 3; 3; 3. **9.** 18; 9; 9; 9. **10.** 8. **11.** 8, 4.

Page 244

Aim: To provide continued practice in division

Suggestions: Stress the relationships which exist between division and multiplication and those between division and subtraction. Encourage the pupils to write the same division fact in various ways, such as:

(1) How many 2's in 10?
(2) 10 divided by 2
(3) $2\overline{)10}$
(4) 10 ÷ 2

Also have the pupils indicate the answer by saying:

(1) There are five 2's in 10.
(2) 2 can be subtracted from 10 five times.

Key: **1.** 10¢ ÷ 2¢ = 5 (marbles); 5. **2.** 8¢ ÷ 2¢ = 4 (sticks); 4. **3.** 18¢ ÷ 2¢ = 9 (stamps); 9; 9. **4.** 16 ÷ 2 = 8 (cages); 8. **5.** 6¢ ÷ 2¢ = 3 (pencils); 3. **6.** 12 ÷ 2 = 6 (bunches). **7.** 18, 9, 9. **8.** 14, 7, 7.

Page 245

Aim: To present the division facts of the 2's in sequential order

Suggestions: Up to this point, the division facts of the 2's have not been presented in sequential order. This follows the textbook plan of encouraging pupils to discover multiplication and division facts in random order since it is in that order that they will encounter the facts in solving problems. However, every set of multiplication and division facts is presented in order after initial discovery and learning has taken place. The advanced pupils will be quick to indicate that a definite relationship exists between all of the division facts of the 2's (the dividends increase by 2 each time). At this point, it is well to point out that every division fact can be *checked* by referring to the corresponding multiplication fact. Also, some pupils will wish to build flash cards for the division facts. If this is done, encourage them to use the division sign $\overline{)\quad}$ rather than the horizontal division sign $\div$.

Workbook Reference: Arithmetic Workshop, Book 3, page 96

Key: **2.** $2 \div 2 = 1$, $4 \div 2 = 2$, $6 \div 2 = 3$, $8 \div 2 = 4$, $10 \div 2 = 5$, $12 \div 2 = 6$, $14 \div 2 = 7$, $16 \div 2 = 8$, $18 \div 2 = 9$. **3.** The seventh; the ninth; nine; five. **4.** The sixth; the eighth. **5.** 12, 6. **6.** 10, 5. **7.** 14, 7. **9.** 5, 9, 1, 7, 4, 6, 8.

Page 246

Aim: To provide word problems involving the division facts of the 2's

Suggestions: In conjunction with this lesson, plan an art class that will provide the pupils with an opportunity to make book covers. Summer is approaching, and some of the children may wish to borrow schoolbooks for the summer. These covers will protect the books during the long vacation period. Others may wish to use their covers for favorite books they own. As the art lesson develops, the word problems connected with the topic "Book Covers" can be discussed and solved.

Key: **1.** $8 \div 2 = 4$ (books); 4. **2.** $10 \div 2 = 5$ (books); 5; 5. **3.** $18 \div 2 = 9$ (books); 9. **4.** 6 books; 8; 7. **5.** $3 \times 2 = 6$ (covers).

Page 247

Aim: To relate the partition concept of division with the concept of *one half* of a group of objects

Suggestions: The pupils are already familiar with the concept *one half* of a single object and have learned how to write it in figures. Begin the lesson by placing a number of objects on the flannel board. Also be ready to equip each child with scissors, round circles made from construction paper, and so on. The first step is to discuss what one half of a single object is. Do this by cutting the circles in half and showing what one half of an object on the flannel board is. Now shift the attention from one half of a single object to one half of a group of objects. Ask all the boys in the classroom to stand. (If the number of boys is uneven, ask the girls to stand, or use some group of objects which total an even number.) Then raise this question: "If I asked one half of the boys to come to the front of the room, how many boys would join me here?" Use other groups of objects, such as groups of books, chairs, or colored discs, to develop the idea that one half of a group is the same as dividing the group into two *parts*, thus the name of the division concept, partition division. *Under no circumstances* should the pupils be troubled with the terms *measurement* or *partition*. These are technical terms used only for the benefit of the teacher; they do not appear in the pupil's textbook. A thorough understanding of the concept stated on page 247 is essential for the pupil. Many children think in terms of fractions and fractional numbers in a very limited manner. They fail to realize that every fraction represents a *division*. In the same manner that every whole number represents a complete entity or group of entities (such as apples, sticks, children, pennies), so every fraction represents a *division* of a whole or group. *One half* means that something has been divided by 2 or into 2 parts. The concept of one half is written as 1 over 2 ($\frac{1}{2}$) to signify that 1 is divided by 2. The denominator of the fraction represents the divisor; the numerator represents what is being divided; the line between the numerator and the denominator can be read as "divided by." Naturally, this discussion is for *your benefit only* and should not be used in the third-grade classroom. However, if the pupil acquires an early understanding of fractions as parts of a whole or group, then more abstract concepts of fractions taught in Grades 6 and 7 will be much simpler for him.

Workbook Reference: Arithmetic Workshop, Book 3, page 97

Key: **2.** 6 lollipops; yes. **3.** No; no. **5.** 3 pennies; 3 pennies. **6.** 4 birds, 9 birds, 5 birds.

Page 248

Aim: To present word problems which use both multiplication and division

Suggestions: This is the first time that the pupils have been faced with a page of word problems, some of which are solved by multiplication and others by division. Before solving the problems, the children are asked to name the process required. This part of the work may be done orally so that you can offer assistance in thinking clearly about the words and their operational significance. The answers to the problems can also be given orally, as all mechanical work is reduced to the simplest form.

Workbook Reference: Arithmetic Workshop, Book 3, page 106

Key: **1.** Divide; 12 eggs ÷ 2 = 6 eggs. **2.** Divide; \$8 ÷ \$2 = 4 (books). **3.** Multiply; 3 × 6 = 18 (lollipops). **4.** Multiply; 2 × 5 = 10 (cards). **5.** Multiply; 3 × 8 = 24 (crayons). **6.** Divide; \$16 ÷ 2 = \$8. **7.** Divide; 10 ÷ 2 = 5 (boxes). **8.** Multiply; 7 × 2 = 14 (children). **9.** Divide; 14 ÷ 2 = 7 (kinds). **10.** Multiply; 7 × 3¢ = 21¢. **11.** Multiply; 2 × \$4 = \$8. **12.** Divide; \$4 ÷ 2 = \$2.

Page 249

Aim: To maintain addition and subtraction skills

Suggestions: Have the class do ex. 1–5 orally. Observe pupil behavior during the written part of this page, and notice those who hesitate or ponder unduly in column addition and regrouping in subtraction. Such children will profit from some *reteaching* and possibly additional practice in the book.

Workbook Reference: Arithmetic Workshop, Book 3, page 98

Key: **1.** 22, 29, 45, 30, 62. **2.** 57, 74, 49, 78, 100. **3.** 51, 88, 42, 54, 34. **4.** 31, 58, 90, 72, 37, 61, 24, 81; adding 7: 32, 59, 91, 73, 38, 62, 25, 82; adding 8: 33, 60, 92, 74, 39, 63, 26, 83; adding 9: 34, 61, 93, 75, 40, 64, 27, 84. **5.** 69, 80, 94, 35, 84, 42, 93, 98; adding 7: 70, 81, 95, 36, 85, 43, 94, 99; adding 8: 71, 82, 96, 37, 86, 44, 95, 100; adding 9: 72, 83, 97, 38, 87, 45, 96, 101. **6.** 192, 178. **7.** 250, 209. **8.** 234, 175. **9.** 121 tickets. **10.** 379 tickets. **11.** 460, 52, 234, 160, 33, 259. **12.** 676, 307, 15, 225, 139, 387. **13.** 144, 85, 199, 92, 164, 570.

Page 250

Aim: To provide further experience in solving word problems dealing with addition and subtraction

Suggestions: Oral discussion of these problems will provide an opportunity to correlate arithmetic and science. The seasons of the year are most interesting, and children of this age level are inquisitive about the world around them.

Key: **1.** 8 birds + 4 birds + 5 birds = 17 birds. **2.** 25 fish − 8 fish = 17 fish. **3.** 6:00 − 4:30 = 1:30, or 1 hour 30 minutes. **4.** 28 flowers − 11 flowers = 17 flowers. **5.** 48 inches − 23 inches = 25 inches. **6.** 3 × 25 = 75 (chickens).

Page 251

Aim: To provide an oral review of simple multiplication and division skills

Suggestions: All of the work on this page should be presented as mental arithmetic. Ex. 11–14 are merely suggestive of the type of exercise you may use. Children will enjoy making up additional work of this type and acting as teacher.

Key: **1.** 10¢ − 0¢ = 10¢. **2.** 5 × 3¢ = 15¢; 9 × 3¢ = 27¢. **3.** 10¢ ÷ 2¢ = 5 (stamps). **4.** 3 × 8 carrots = 24 carrots. **5.** Five. **6.** 6 × 3 feet = 18 feet; 4 × 3 feet = 12 feet. **7.** 8 × 2 pints = 16 pints; 7 × 2 pints = 14 pints. **8.** 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30; 3, 6, 9, 12, 15, 18, 21, 24, 27, 30; 5, 10, 15, 20, 25, 30. **9.** 30, 72, 43, 78, 21, 49, 94, 56. **10.** 33, 75, 46, 81, 24, 52, 97, 59; adding 6: 31, 73, 44, 79, 22, 50, 95, 57; adding 7: 32, 74, 45, 80, 23, 51, 96, 58; adding 9: 34, 76, 47, 82, 25, 53, 98, 60. **11.** 7, 16, 17, 4. **12.** 5, 18, 3, 14. **13.** 9, 12, 8, 15. **14.** 6, 0, 9, 3. **15.** 15. **16.** 3, 13. **17.** 1000, 1001.

Page 252

Aim: To review the multiplication skills taught in Chapter 6

Key: **1.** 3 × 10 = 30 (candies); 4 × 10 = 40 (candies); 6 × 10 = 60 (candies); 9 × 10 = 90 (candies); 7 × 10 = 70 (candies). **2.** 3 × \$.32 = \$.96; 4 × \$.32 = \$1.28; 6 × \$.32 = \$1.92. **3.** 2 × \$1.03 = \$2.06; 3 × \$1.03 = \$3.09; 4 × \$1.03

= \$4.12. **4.** 172, 285, 84, 132, 454, 560, 927. **5.** 88, 135, 154, 147, 550, 638, 800. **6.** 102, 96, 30, 291, 951, 918, 472. **7.** 279, 252, 196, 114, 318, 642, 672. **8.** 54, 110, 180, 34, 681, 852, 378. **9.** 108, 32, 171, 120, 676, 627, 614. **10.** 110, 144, 174, 138, 60, 230, 432; 165, 216, 261, 207, 90, 345, 648. **11.** \$6.50, \$2.64, \$4.08, \$6.32, \$8.56; \$9.75, \$3.96, \$6.12, \$9.48, \$12.84.

Page 253

Aim: To develop readiness for the division facts of the 3's

Suggestions: Use the approach recommended for teaching pages 241–242. Relate division to multiplication. Encourage the pupils to refer to their individual multiplication tables (see the suggestions for teaching page 200) to discover the answers to these division facts.

Key: **1.** 4 groups; 4. **2.** 5 groups; 5; 5. **3.** 7 groups; 7. **4.** 9; 3. **5.** 18, 6. **6.** 24; 8.

Pages 254–255

Aim: To teach the division facts of the 3's

Suggestions: Once again, the facts are presented in random order and the pupils are encouraged to associate them with corresponding multiplication facts (ex. 3–9, page 254). Ask the children to tell which facts dealing with 3's are not listed on these lines. In ex. 7 on page 255, the facts are arranged in order. Instruct the children to prove these facts by subtraction (see the suggestions for page 243). Encourage the building of flash cards for these facts.

Workbook Reference: Arithmetic Workshop, Book 3, page 100

Key: Page 254 **1.** Yes; 9. **2.** 8; 8. **3.** 2. **4.** 4, 4. **5.** 8, 8. **6.** 6, 6. **7.** 9, 9. **8.** 7, 7. **9.** 5, 5. **10.** 15¢ ÷ 3¢ = 5 (crayons); 5. **11.** 12 ÷ 3 = 4 (days); 4. **12.** 24 ÷ 3 = 8 (yards); 8. **13.** 27¢ ÷ 3¢ = 9 (stamps).

Page 255 **1.** 6, 9, 3. **2.** 8, 5, 2. **3.** 4, 7, 9. **4.** 5, 7, 4, 2. **5.** 9, 8, 6, 3. **6.** 4, 9, 8, 1. **8.** $3 \times 1 = 3, 3 \times 2 = 6, 3 \times 3 = 9, 3 \times 4 = 12, 3 \times 5 = 15, 3 \times 6 = 18, 3 \times 7 = 21, 3 \times 8 = 24, 3 \times 9 = 27$. **9.** 6, 8, 3, 5, 7, 2, 9. **10.** \$15 ÷ \$3 = 5 (lessons). **11.** \$12 ÷ \$3 = 4 (lessons). **12.** 9¢ ÷ 3¢ = 3 (apples).

Page 256

Aim: To teach how to find $\frac{1}{3}$ of a number

Suggestion: This is very similar to the work on page 247. Again the pupil is being prepared for future work with fractions.

Workbook Reference: Arithmetic Workshop, Book 3, page 101

Key: **2.** 4 pencils; 4 pencils. **3.** Four. **4.** 4; 4. **5.** 6 pennies; 6¢; 6. **6.** 9¢, 4¢, 3¢, 8¢. **7.** 7¢, 5¢, 1¢, 6¢.

Page 257

Aim: To review finding $\frac{1}{2}$ and $\frac{1}{3}$ of groups (partition division)

Suggestions: Ex. 1–7 should be done orally. Ex. 8 develops a most important concept of fractions — the *larger the denominator of a unit fraction, the smaller the quantity it represents.* Naturally, the pupil does not say this rule in these words; nevertheless, he begins to acquire this basic understanding. Develop it by using objects. (A Fractional Parts Chart will provide excellent visual aids for this lesson.)

Key: **1.** 12 marbles ÷ 3 = 4 marbles; 24 marbles ÷ 3 = 8 marbles; 15 marbles ÷ 3 = 5 marbles; 18 ÷ 3 = 6; 6 ÷ 3 = 2; 21 ÷ 3 = 7; 9 ÷ 3 = 3. **2.** 18 books ÷ 2 = 9 books; 14 books ÷ 2 = 7 books; 12 books ÷ 2 = 6 books; 10 ÷ 2 = 5; 6 ÷ 2 = 3; 16 ÷ 2 = 8; 8 ÷ 2 = 4; 4 ÷ 2 = 2. **3.** 6 eggs ÷ 3 = 2 eggs; 18 eggs ÷ 3 = 6 eggs; 12 eggs ÷ 3 = 4 eggs; 3 eggs ÷ 3 = 1 egg; 15 ÷ 3 = 5; 9 ÷ 3 = 3. 27 ÷ 3 = 9; 21 ÷ 3 = 7. **4.** 12 dots ÷ 2 = 6 dots; 6 dots. **5.** 12 dots ÷ 3 = 4 dots. **6.** $\frac{1}{2}$ of 12 dots has more. **7.** $\frac{1}{2}$ of 18 apples is larger. **8.** $\frac{1}{2}$ pie is larger. **9.** 6 lollipops ÷ 2 = 3 lollipops; 6 lollipops ÷ 3 = 2 lollipops. **10.** 7, 9, 8, 4. **11.** 7, 5, 6, 3. **12.** 5, 8, 6, 3.

Pages 258–259

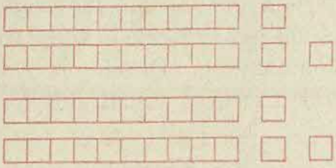
Aim: To teach division of 2-figure and 3-figure numbers by 2 and 3, with no carrying or remainders

Suggestions: The exercises on these two pages require no carrying and have no remainders. Notice on page 259 that the 2-figure and the 3-figure numbers used as dividends are made up of especially selected numbers so that each figure of the dividend is exactly divisible by 2 or 3. In other words, the division is exact and involves no changing. Likewise, no zeros appear in the dividends since the zero facts in division are not introduced until page 271.

The real teaching challenge on page 258 is to redirect the pupil's pattern of operational behavior. To date, the child has been told (in addition, subtraction, and multiplication) to start with the ones place first, then go to the tens, and then to the hundreds place. This has been a *right-to-left direction.* Now the pupil is instructed to start with the tens place first and then go to the ones place. This is a *left-to-right direction.* Of course, the unobservant teacher will assume that all children readily grasp this reversal in direction if the answers on their papers are all correct. However, a pupil could operate from right to left on these two pages and *get every answer correct.* It is therefore imperative that you *point out* and *explain* this change of direction to the pupils and insist that much of the early work in division be done orally so that everyone will understand this change in direction. Page 259 also teaches that division may be checked by multiplication. As division facts have already been checked by this method, checking of examples by multiplication is not completely new.

Additional meaning can be provided in the explanation of the sample problem on page 258 by representing the 46 stamps with 4 rows of ten stamps each and

6 single stamps. Let the pupils discover for themselves how to partition them equally among the two boys to find each boy's *share*. Old seals might be used for this purpose. The work below might be placed on the board.



$$\begin{array}{r} 2\text{ tens} + 3\text{ ones} \\ 2\overline{)4\text{ tens} + 6\text{ ones}} \end{array} \qquad \tfrac{1}{2}\text{ of } 46 = 23$$

$$(4\text{ tens} + 6\text{ ones}) \div 2 = 2\text{ tens} + 3\text{ ones}$$

Workbook Reference: Arithmetic Workshop, Book 3, pages 102 and 103

Key: Page 258 **3.** 36 stamps ÷ 3 = 12 stamps. **4.** 69¢ ÷ 3 = 23¢.

Page 259 **1.** 31, 44, 21, 22, 11, 13. **2.** 33, 12, 41, 22, 42, 33. **3.** 34, 23, 24, 11, 31, 21. **6.** 124, 423, 223, 442, 313, 141. **7.** 332, 221, 232, 131, 111, 223. **8.** 234, 342, 212, 343, 222, 221. **9.** 121, 422, 133, 331, 412, 113. **10.** 113, 333, 242, 322, 444, 324. **11.** 311, 132, 122, 331, 312, 414.

Page 260

Aim: To provide problem-solving experiences in addition and subtraction

Suggestion: Most children, especially those who regularly watch television, are familiar with a circus. Little difficulty or resistance will be encountered in discussing this subject. Since the operational skills required to solve these problems have been mastered by this time, the pupils should complete this work without hesitation.

Key: **1.** 450 people + 525 people = 975 people. **2.** 8 elephants + 5 elephants = 13 elephants. **3.** 4 clowns + 5 clowns + 8 clowns = 17 clowns. **4.** 8 clowns − 3 clowns = 5 clowns. **5.** 7 ponies + 5 ponies + 7 ponies = 19 ponies. **6.** 30¢ + 20¢ = 50¢.

Page 261

Aim: To extend the understanding of liquid measure to include the *gallon*

Suggestions: Use the closed-book approach to this lesson. Review with the class the experiment completed on page 176 dealing with cups, pints, and quarts. Have on display a gallon jug, a 5-gallon oil can, and a ½ gallon milk container. Urge the pupils to talk about the new word *gallon* which you will have written on the board. Ask such questions as: "What do we buy by the gallon?" and "What do we buy by the half gallon?" List some of the things which we buy in these measures. Then have the children open their books and begin to work. If they hesitate on ex. 8–11, have a more advanced pupil write some of the equivalents on the board. Complete the work on this page by providing some exercises in mental estimation. Show the class a jug containing a quantity of water and ask them to estimate how much water is in the jug, *i.e.*, a quart, 2 quarts, a gallon, 2 gallons. Similar work can be done in reviewing the pint, $\frac{1}{2}$ pint, and cup. Children should be continually challenged to estimate quantities, thus strengthening their basic understanding of measures.

Workbook Reference: Arithmetic Workshop, Book 3, page 117

Key: **2.** 4 quarts. **3.** 2 quarts. **4.** Gasoline. **6.** 2 pints; 8 pints; 16 pints. **8.** 6, 4. **9.** 4, 4. **10.** 4, 12. **11.** 8, 3.

Page 262

Aim: To teach an important problem pattern in division

Suggestions: This page is devoted to a presentation of one of the important problem patterns in division. This pattern represents the *measurement* concept in division and relates in particular to the buying of several things of the *same kind.* If you know the cost of one thing and the amount of money you have to spend, you learn from this pattern how many things of the same kind you can buy. A practical problem illustrating this pattern is the following: "At 5¢ each, how many apples can you buy for 20¢?"

Key: **1.** 12¢ ÷ 2¢ = 6 (cakes). **2.** 12¢ ÷ 3¢ = 4 (larger cakes). **3.** 9¢ ÷ 3¢ = 3 (pencils). **4.** 15¢ ÷ 3¢ = 5 (apples). **5.** 27¢ ÷ 3¢ = 9 (marbles). **6.** 10¢ ÷ 2¢ = 5 (stamps). **7.** \$6 ÷ \$2 = 3 (books). **8.** 24¢ ÷ 3¢ = 8 (hats). **9.** 8¢ ÷ 2¢ = 4 (pencils). **10.** 18¢ ÷ 3¢ = 6 (stamps).

Page 263

Aim: To maintain skill in multiplication

Suggestions: Ex. 1–3 are to be done orally. Explain that the ( ) indicate that the multiplication should be done first. Notice that all the multiplication facts dealing with the 2's and the 3's are found on this page together with some of the 1's and 0's. All the steps taught to date are also included.

Workbook Reference: Arithmetic Workshop, Book 3, page 106

Key: **1.** 17, 19, 17. **2.** 19, 29, 13. **3.** 26, 16, 22. **4.** 252, 434, 214, 420, 658; 378, 651, 321, 630, 987. **5.** 630, 418, 600, 248, 260; 945, 627, 900, 372, 390. **6.** 2 × 125 stamps = 250 stamps. **7.** 2 × \$.85 = \$1.70. **8.** 478, 375, 954, 834, 612, 672. **9.** 963, 816, 490, 927, 852, 636. **10.** 927, 618, 951, 678, 470, 560. **11.** 212, 721, 387, 345, 800, 850.

Page 264

Aim: To teach division of 3-figure numbers by 2 and 3 when the quotient is offset

Suggestions: So far, the quotients of all long division examples have contained as many figures as the dividend. This allowed the pupil to place the quotient figure directly above the dividend figure and thus see a one-to-one comparison between place value in the dividend and the quotient. Here, however, this one-to-one arrangement disappears, and it is necessary to "offset" the quotient. This new process step calls for an adequate understanding of place value as well as the left-to-right directional pattern of the division operation. In the illustration at the right of the page, it is evident that you cannot divide 1 hundred by 2. But it is possible to divide 12 tens by 2, thus obtaining 6 tens. Pupils should be taught to read numbers such as 126 as 12 tens and 6 ones, as well as 1 hundred + 2 tens + 6 ones. If they know how to do this, it is not necessary to convert 1 hundred to 10 tens and add them to the 2 tens to obtain 12 tens. To emphasize the proper placement of the 6 in the quotient, you may wish to divide on the board as shown on the right. It is very important that pupils understand the reason for the proper placement of quotient figures. Use a variety of approaches and manipulative materials to illustrate this critical skill. Place heavy emphasis upon demonstrations with a place pocket chart. Avoid meaningless drill. Check quotients by multiplication.

$$\begin{array}{r} 6\text{ tens} + 3\text{ ones} \\ 2\overline{)12\text{ tens} + 6\text{ ones}} \end{array}$$

Key: **2.** 126 ÷ 3 = 42 (white chickens). **3.** 168 eggs ÷ 2 = 84 eggs. **4.** 12 (eggs in a dozen) and 7 (dozen).

Page 265

Aims: To maintain skill in division with 2's and 3's; to provide further practice with offset quotients and partition division

Suggestions: Ex. 1–6 may be completed orally; but beginning with ex. 7, examples involving offset quotients appear. Keep careful watch for those who are still avoiding the left-to-right direction. Also insist that the pupils place the quotient figures in the proper places directly above dividend figures. Beginning with ex. 13, the partition concept of division again appears; and the pupils should be instructed to write these examples using the division sign $\overline{)\quad}$.

Key: **1.** 2. **2.** 3. **3.** 6, 9, 12, 13. **4.** 5, 7, 23, 33. **5.** 8, 9, 6, 7. **6.** 8, 5, 11, 23. **7.** 51, 62, 41, 71, 92. **8.** 84, 72, 72, 43, 82. **9.** 82, 63, 64, 52, 94. **10.** 51, 54, 93, 71, 63. **11.** 96 stamps ÷ 3 = 32 stamps. **12.** \$28 ÷ 2 = \$14. **13.** 33, 81, 62, 42. **14.** 42, 53, 53, 61. **15.** 34, 83, 73, 81. **16.** 22, 91, 91, 83.

Page 266

Aims: To teach the meaning of the abbreviations A.M. and P.M.; to reteach the terms *before* and *past* the hour

Suggestions: In connection with the work on pages 106–107, it was suggested that the pupils construct clocks out of paper plates. Plates still on hand will provide excellent reteaching materials for *before* and *past* the hour. The new concept of *half past* can be developed at this time. After the children have reviewed the previous work with clocks, the new teaching materials dealing with A.M. and P.M. can be introduced. Reference to favorite television programs will assist in teaching the P.M. abbreviation. (Reference to the Latin words for which these abbreviations stand should be delayed until a higher grade level.) However, if superior children request the information, be sure to give them the answer.

Key: **1.** 6 o'clock in the morning. **2.** 60 minutes; 60 minutes. **3.** 60 minutes; 60 minutes. **4.** 30 minutes; 30 minutes. **5.** Half past 5, or five thirty; half past 2, or two thirty; half past 8, or eight thirty; half past 10, or ten thirty; 5:30, 2:30, 8:30, 10:30.

Page 267

Aim: To continue the reading of clocks to 5-minute intervals

Suggestions: Use individual pupil clocks and have the pupils set them for various times that are meaningful to the school situation. Most children will have already mastered this skill, and so little time need be devoted to this page during the regular class period. This type of activity is much better conducted on an everyday basis rather than during a specialized arithmetic period. Constant reference to the clock and how to write the time becomes routine performance for the alert teacher who constantly correlates arithmetic with the everyday experiences of her pupils in the school-home community.

Key: **1.** D shows 10 minutes to 4. **11.** 10 minutes; 20 minutes. **12.** 20 minutes; 35 minutes.

Page 268

Aim: To present word problems which may be solved by using one of the four fundamental operations

Suggestions: This is the first time in the third grade that pupils are confronted with a page of word problems which employ all of the four fundamental operations. The topic of a dog, however, is a popular one; and children will be happy to solve problems about a favorite pet. Few children have difficulty in solving word problems that make sense to them. They do not have to sit back and ask themselves, "Do I divide or add?" *The problems themselves suggest the correct operation.* It is obvious in problem 2, for instance, that the savings must be *added* to tell how much they had in all.

Key: **1.** $24 ÷ 2 = $12. **2.** $3.15 + $2.90 + $3.30 = $9.38; no. **3.** $12.00 − $9.38 = $2.62. **4.** 3 × $.90 = $2.70; yes; yes; $.08.

Page 269

Aim: To maintain skills in the fundamental operations of addition and subtraction

Key: **1.** 252, 160. **2.** 206, 190. **3.** 224, 235. **4.** 49 papers + 60 papers + 41 papers + 52 papers = 202 papers. **5.** 75¢ + 35¢ + 60¢ + 85¢ = $2.55. **6.** 237, 221, 217, 230, 281, 263, 247. **7.** $5.00 − $3.89 = $1.11. **8.** 50 tickets − 19 tickets = 31 tickets. **9.** 173, 234, 379, 170, 227, 259. **10.** 498, 357, 114, 706, 88, 54. **11.** 645, 196, 481, 90, 525, 263.

Page 270

Aim: To present an important problem pattern in division relating to sharing

Suggestions: This problem pattern is summarized in the box. A large number of everyday problems in division fall within this pattern. In connection with these problems it is important to explain the similarity in the meaning of the expressions "to share equally" and "to divide equally." Make clear that if 10¢ is divided equally between 2 children, each child gets 5¢. If one child should get 4¢ and the other 6¢, it is evident that they would not share equally. The vocabulary terms *equally, share equally,* and *divide equally* are used quite frequently by children at this grade level.

Key: **1.** 10 ÷ 2 = 5 (fish). **2.** 18 ÷ 3 = 6 (fish). **3.** 68¢ ÷ 2 = 34¢. **4.** $24 ÷ 3 = $8. **5.** 24 roses ÷ 2 = 12 roses. **6.** $15 ÷ 3 = $5. **7.** 12 pencils ÷ 2 = 6 pencils.

Page 271

Aim: To lead pupils to generalize that 0 divided by any other number yields 0

Suggestions: Review how any division fact can be checked by multiplication. For example, it can be proved that 18 ÷ 3 = 6, because 6 × 3 = 18. Similarly, in the case of 0 ÷ 2 = _?_, the number we are looking for when multiplied times 2 must yield 0. Obviously the only number that will work is 0; hence 0 ÷ 2 = 0. To lend social application to the zero division facts, this explanation can be supplemented by illustrations such as ex. 2. After a few examples of this kind the pupils should be ready for the generalization which follows ex. 4.

The teacher should be very careful *not* to ask pupils to complete sentences such as, 2 ÷ 0 = _?_. A little reflection will convince the most skeptical that there is no number which yields 2, when multiplied times 0. Division by 0 is an excluded operation in mathematics. In mathematics we say that the quotient approaches infinity as the divisor approaches zero, but division by zero is meaningless. Whereas for a pair of multiplication facts such as 3 × 4 = 12 and 4 × 3 = 12 there are two related division facts, 12 ÷ 4 = 3 and 12 ÷ 3 = 4, this is not true in the case of the zero facts. For example, for the pair of multiplication facts, 6 × 0 = 0 and 0 × 6 = 0, there is but one related division fact, namely, 0 ÷ 6 = 0. From this it can be seen that while there are 100 multiplication facts if the zero facts are counted, there are only 90 division facts since 10 cases of division by 0 are excluded.

Lead the pupils to see the need for writing a zero in the quotient of ex. 5. Demonstrate with a place pocket chart that if 12 tens are divided into 2 equal groups, there will be 6 tens in each equal group. Stress the role of zero as a place holder in both the dividend and the quotient in examples of this type.

Workbook Reference: Arithmetic Workshop, Book 3, page 116

Key: **1.** 3 lollipops; 3. **2.** No apples; 0. **4.** 0, 0, 0. **6.** 80¢ ÷ 2 = 40¢. **7.** 60¢ ÷ 3¢ = 20 (stamps). **8.** 90¢ ÷ 3 = 30¢.

Page 272

Aim: To extend zero difficulties in division to 3-figure dividends

Suggestions: One good way for pupils to see how ridiculous an answer of 21 is for the example on the right is to have them estimate what a sensible

$$\begin{array}{r} 21 \\ 3\overline{)603} \end{array}$$

answer would be before dividing on paper. 6 hundred ÷ 3 = 2 hundred, and since 603 is larger than 600 the quotient must be a little larger than 200. This type of logic may be supplemented by showing the division performed in other ways such as the following:

$$\begin{array}{r} 2\text{ hundred} + 0\text{ tens} + 1\text{ one} \\ 3\overline{)6\text{ hundred} + 0\text{ tens} + 3\text{ ones}} \end{array} \qquad \begin{array}{r} 200 + 1 \\ 3\overline{)600 + 3} \end{array} \qquad \begin{array}{r} 1 \\ 200 \\ 3\overline{)603} \\ \underline{600} \\ 3 \\ \underline{3} \end{array}$$

The reason for showing other methods such as these is to enable pupils to see the place value significance of the quotient figures and thus avoid senseless mistakes. It may be truly said that an ounce of understanding is sometimes worth a pound of drill.

Workbook Reference: Arithmetic Workshop, Book 3, page 116

Key: **1.** 40 marbles ÷ 2 = 20 marbles. **2.** 68¢ ÷ 2 = 34¢. **3.** 88 marbles ÷ 2 = 44 marbles. **4.** 30, 90, 60, 300, 93, 63; 20, 60, 40, 200, 62, 42. **5.** 33, 330, 303, 120, 333, 123; 22, 220, 202, 80, 222, 82. **6.** 80, 50, 102, 402, 100. **7.** 201, 53, 70, 70, 72. **8.** 52, 300, 404, 53, 200.

Page 273

Aim: To maintain multiplication and division skills

Suggestion: This page will prove to be time-consuming, and some teachers will tend to short-cut this practice page by suggesting the omission of certain examples. This page is planned to give a comprehensive review of multiplication and division work.

Workbook Reference: Arithmetic Workshop, Book 3, pages 106 and 107

Key: **1.** 438, 656, 218, 250, 628, 254; 657, 984, 327, 375, 942, 381. **2.** 246, 414, 630, 460, 452, 616; 369, 621, 945, 690, 678, 924. **3.** 3 × 204 = 612. **4.** 5 × $1.10 = $5.50. **5.** 892, 372, 654, 276, 612, 892. **6.** 348, 498, 321, 791, 927, 614. **7.** 264 ÷ 2 = 132; 213, 92, 54, 83, 64. **8.** 111, 74, 51, 81, 62, 73. **9.** 129 ÷ 3 = 43; 51, 61, 92, 71, 81. **10.** 221, 91, 63, 41, 73, 123. **11.** 96 books ÷ 3 = 32 books. **12.** 233, 72, 52, 61, 131. **13.** 94, 93, 134, 331, 411.

Page 274

Aim: To provide oral practice in multiplication and division facts taught in Grade 3.

Suggestion: This is excellent oral work to be used primarily to assist pupils who did not secure satisfactory ratings on the previous page.

Key: **1.** 6, 15, 14, 9, 8, 18, 0, 2, 12. **2.** 10, 18, 0, 12, 3, 4, 21, 27, 16. **3.** 2, 0, 18, 12, 21, 27, 10, 24, 18. **4.** 8, 15, 16, 6, 24, 14, 3, 0, 12. **5.** 1, 2, 4, 6, 9. **6.** 0, 2, 6, 8, 5. **7.** 3, 0, 4, 8, 7. **8.** 3, 1, 7, 5, 9.

Page 275

Aim: To further emphasize the inverse relationship between multiplication and division

Key: **1.** 9. **2.** 8, 8. **3.** 6, 6. **4.** 5, 5. **5.** 8, 8. **6.** 6, 6. **7.** 7, 7. **8.** 9, 9. **9.** 7, 7. **10.** 5, 5. **11.** 4, 4. **12.** 9, 9. **13.** 8, 8. **14.** 5, 5. **15.** 8, 8. **16.** 9, 9.

Page 276

Aim: To test vocabulary words and basic understandings

Suggestion: Instruct the pupils to write only the answers on paper.

Key: **1.** Yard. **2.** Division. **3.** Dozen. **4.** February. **5.** November. **6.** Thursday. **7.** Divide. **8.** Noon. **9.** Christmas. **10.** Quart; pint. **11.** Divide; add. **12.** Divide. **13.** Inch; yard; foot. **14.** Multiply. **15.** Multiply.

Page 277

Aim: To teach measures of weight: *ounce* and *pound*

Suggestions: Use the closed-book approach to this lesson, and have available articles that are bought by the pound. Ask what other things can be bought by the pound. Make a listing on the chalkboard. Ask the pupils if they know how many ounces are in a pound and how many in a half pound. Write the figures on the board. Then present the development on page 277. Many children will know their weight and might enjoy figuring out how much they weigh in ounces. If multiplication facts not yet taught are needed, allow the more advanced pupils to make these computations for the rest of the class. This activity will also review the reading of large numbers and place value.

Key: **4.** 53 pounds − 49 pounds = 4 pounds. **5.** 3 × 16 ounces = 48 ounces.

Page 278

Aim: To review and test some of the major aims of Chapter 7

Suggestions: This review tests five of the nine major aims listed in this Guide, as follows:

Chapter Review	*Aim Number*
Ex. 1–4	2
Ex. 5–8	4 and 8
Ex. 9–12	4
Ex. 13–17	3 and 5

Aim 1 is not tested at this time, as many pages in the following chapter are devoted to this type of review. Aim 6 is developed and tested in the Problem Test to follow; and aim 7 (to reteach simple understandings about the clock) is not formally tested, as this can be done in the day-to-day activities in the classroom.

Key: **1.** 8, 8. **2.** 7, 7. **3.** 6, 6. **4.** 9, 9. **5.** 8, 12. **6.** 30, 6. **7.** 2. **8.** 3. **9.** 31, 43, 93, 401. **10.** 31, 72, 52, 61. **11.** 12, 74, 213, 60. **12.** 42, 50, 83, 82.

13. 10, 120, 92, 320, 232, 220. **14.** 22, 122, 210, 104, 82, 63. **15.** 10, 114, 110, 73, 71, 310. **16.** 41, 103, 332, 211, 342, 90. **17.** 32, 80, 50, 312, 230, 93.

Page 279

Aim: To present Problem Test 7

Suggestion: All types of thought patterns are tested in these problems, but emphasis is placed on division thought patterns.

Key: **1.** 60¢ ÷ 3¢ = 20 (stamps). **2.** \$8.65 + \$4.50 + \$3.75 = \$16.90. **3.** \$42 − \$34 = \$8. **4.** 3 × \$18 = \$54. **5.** From 8:25 to 8:40 is 15 minutes. **6.** 9 × 3¢ = 27¢. **7.** \$5.00 − \$4.69 = \$.31. **8.** 660 buttons ÷ 3 = 220 buttons. **9.** \$120 ÷ 3 = \$40. **10.** \$7.05 − \$6.38 = \$.67.

Page 280

Aim: To provide a diagnostic test to check division skills learned in this chapter

Suggestion: The work on this page is carefully graded beginning with basic division facts (ex. 1–3) and continuing to partition division in ex. 10–12. Extra practice pages are suggested for those pupils who need additional help.

Key: **1.** 4, 7, 2, 8, 6. **2.** 2, 8, 3, 9, 4. **3.** 0, 0, 0, 0, 0. **4.** 43, 112, 342, 413. **5.** 21, 231, 112, 321. **6.** 74, 61, 93, 52. **7.** 52, 73, 91, 82. **8.** 20, 110, 302, 70. **9.** 30, 130, 60, 300. **10.** 9, 3, 7. **11.** 121, 91, 232. **12.** 212, 71, 83.

Chapter 8

Aims of Chapter 8. The major aims of Chapter 8 are to:

1. Review and test the addition, subtraction, multiplication, and division skills taught in Grade 3.
2. Review and test understandings of measures, the clock, the calendar, money, and making change.
3. Teach the multiplication facts of 4's and 5's and their reverses.
4. Teach the division facts of 4's and 5's.
5. Teach how to find $\frac{1}{4}$ and $\frac{1}{5}$ of a number.
6. Provide extra practice in the four fundamental operations with cross references from earlier pages in the text.

Chapter 8 serves two major purposes:

1. It provides 11 pages of excellent end-of-year tests.
2. It makes provision for those schools which require third-grade pupils to master the multiplication and division facts of the 4's and the 5's.

Following Chapter 8 are 14 pages of "More Practice" work which may be used directly with practice exercises scattered throughout the book.

It is strongly recommended that all teachers use the end-of-year tests which begin on page 300 (with the possible omission of page 309) and terminate on page 310. Helpful suggestions may be given those pupils who need extra summer work by referring to specific pages in the textbook or to the "More Practice" pages which begin on page 313. If, however, the course of study requires the work on the tables of 4's and 5's, the first 19 pages of the chapter should be emphasized.

Page 281

Aim: To teach the multiplication facts of the 4's

Suggestions: Notice once again the additive approach to the discovery of these facts. After all of the facts have been discovered, urge the pupils to record them on their individual multiplication tables (see the suggestions for teaching page 200).

Workbook Reference: Arithmetic Workshop, Book 3, pages 109 and 110

Key: **1.** 3×4 children = 12 children; 12; 12. **2.** 4×4 children = 16 children; 16; 16. **3.** 20 dots; 24 dots; 28 dots. **4.** 20; 24; 28. **5.** 32; 36.

Page 282

Aim: To teach the reverses of the multiplication facts of the 4's

Suggestions: The relationships which exist between the facts and their reverses is now well known, and little difficulty should be encountered. Beginning with ex. 8, the 17 multiplication facts dealing with the 4's are listed in order, followed by random practice on them in ex. 9 and 10. At this point, the pupils should record the reverses of the 4's on their multiplication tables.

Workbook Reference: Arithmetic Workshop, Book 3, page 111

Key: **1.** 20. **2.** 20; 20. **4.** 4 × 6 = 24. **5.** 28, 28, 28. **6.** 32, 32, 32. **7.** 36, 36, 36. **9.** 20, 28, 0, 16, 8, 32, 12, 36, 24. **10.** 32, 4, 36, 0, 24, 12, 20, 8, 28.

Page 283

Aim: To present an oral review of the multiplication facts taught to date

Key: **1.** 4 × \$3 = \$12. **2.** 4 × 4¢ = 16¢. **3.** 4 × 7¢ = 28¢. **4.** 6 × 4 glasses = 24 glasses. **5.** 28, 7, 12, 24, 18, 15, 8, 36, 12. **6.** 20, 0, 24, 0, 32, 12, 16, 6, 16. **7.** 9, 24, 12, 8, 9, 15, 14, 27, 4. **8.** 24, 10, 36, 4, 14, 18, 0, 18, 28. **9.** 20, 21, 16, 4, 18, 32, 6, 27, 21. **10.** 30, 9, 14, 26, 20, 17, 10, 38, 14; 22, 2, 26, 2, 34, 14, 18, 8, 18; 11, 26, 14, 10, 11, 17, 16, 29, 6; 26, 12, 38, 6, 16, 20, 2, 20, 30; 22, 23, 18, 6, 20, 34, 8, 29, 23. **11.** 24, 8, 32, 20, 4, 36, 12, 28, 16; 18, 6, 24, 15, 3, 27, 9, 21, 12.

Page 284

Aim: To extend multiplication of 2-figure and 3-figure numbers to include the facts pertaining to the 4's

Suggestion: If anyone hesitates on these examples, urge him to explain them aloud so that you can determine whether his difficulty is in multiplication or in addition. The extension to dollars and cents is routine in nature.

Key: **1.** 4 × 12 = 48 (hats). **2.** 4 × \$.70 = \$2.80. **3.** 4 × \$.75 = \$3.00. **4.** 212, 76, 288, 820, \$2.72, \$4.96. **5.** 104, 152, 188, 484, \$3.56, \$8.68. **6.** 256, 364, 340, 896, \$1.48, \$8.84. **7.** 132, 70, 301, 1094, \$3.72, \$6.84. **8.** 216, 360, 272, 1676, \$1.47, \$16.70.

Page 285

Aim: To teach the division facts of the 4's

Suggestions: The discovery of these facts rests on the pupil's ability to correlate them with the corresponding multiplication facts. However, when the class reaches ex. 8, it might be well to ask certain pupils to demonstrate to the class how they would prove these facts by subtraction. The subtractive nature of division needs to be constantly stressed. Some pupils may wish to build flash cards for these division facts.

Workbook Reference: Arithmetic Workshop, Book 3, page 114

Key: **1.** 6 groups; 6. **2.** Yes. **3.** 5, 5. **4.** 8, 8. **5.** 4, 4. **6.** 9, 9. **7.** 7, 7. **10.** 5, 2, 8, 4, 7, 9, 6; 5.

Page 286

Aim: To teach how to find $\frac{1}{4}$ of a number

Suggestion: The work on this page may be oral in nature. Stress frequently that $\frac{1}{4}$ of a number means to divide the number by 4.

Workbook Reference: Arithmetic Workshop, Book 3, page 115

Key: **1.** Yes; one fourth; $\frac{1}{2}$ of a sandwich. **2.** One fourth, or one quarter; 2; 2; yes. **3.** 3 pennies; 3; 3. **4.** 24 marbles ÷ 4 = 6 marbles. **5.** \$16 ÷ 4 = \$4. **6.** 1, 5, 3, 7. **7.** 2, 8, 6, 9.

Page 287

Aim: To provide problem situations involving the division facts of the 4's

Suggestions: The topics of these problems are random in nature, but all deal with everyday situations. Some pupils may need teacher supervision when deciding which *process to use.* However, most children should complete the problems without assistance. Ex. 10 and 11 contain offset quotients and zeros in the dividend.

Key: **1.** 16 apples ÷ 4 = 4 apples. **2.** 20¢ ÷ 4¢ = 5 (crayons); 8¢ ÷ 4¢ = 2 (crayons); 36¢ ÷ 4¢ = 9 (crayons); 24¢ ÷ 4¢ = 6 (crayons). **3.** 4 × 6 = 24 (cookies). **4.** 32 ÷ 4 = 8 (rows). **5.** 4 × 9¢ = 36¢. **6.** 36 inches; 9 inches. **7.** 16 ounces; 4 ounces. **8.** 4 quarts; 20 quarts; 32 quarts. **9.** 480 tickets ÷ 4 = 120 tickets. **10.** 12, 71, 32, 80, 92, 42. **11.** 20, 102, 51, 41, 62, 110.

Page 288

Aim: To teach the multiplication facts of the 5's

Suggestions: There are probably no easier facts to discover than those dealing with the 5's. By counting by fives the children have all of them in a matter of seconds. If the number chart constructed in connection with the work on page 30 is still available, it should be displayed when the counting takes place. The tags for 5, 10, 15, and so on can be removed from the chart and placed on the chalk tray. These numbers constitute the products for the table of 5's. The pupils will be eager to generalize about the table of 5's and will have no difficulty in posting the products on their individual multiplication tables.

Key: **1.** 30 pennies; 30; 30. **2.** 30. **3.** 5, 35; 35. **4.** Seven 5's are 35, so eight 5's are 5 more than 35, or 40; eight 5's are 40, so nine 5's are 5 more than 40, or 45. **5.** 45, 5, 20. **6.** 10, 30, 0. **7.** 25, 15, 35. **8.** 7 × 5¢ = 35¢. **9.** 8 × 5¢ = 40¢. **10.** 3 × 5¢ = 15¢. **11.** 6 × 5¢ = 30¢. **12.** 9 × 5¢ = 45¢. **13.** 4 × 5¢ = 20¢.

Page 289

Aim: To teach the reverses of the multiplication facts of the 5's

Suggestion: The commutative principle is now understood, and these facts can be posted at once on the individual multiplication tables. The 17 facts dealing with the 5's are arranged in order in ex. 4 of this page, and ex. 5–10 provide easy review of the 5's and their reverses.

Key: **2.** 30, 30. **3.** 35, 35; 40, 40; 45, 45. **5.** 35, 5, 15, 30, 45, 0, 20, 40, 10. **6.** 30, 10, 40, 0, 25, 15, 45, 20, 35. **7.** 5 × \$3 = \$15. **8.** 5 × 7¢ = 35¢. **9.** 6 × \$5 = \$30. **10.** 5 × \$2 = \$10.

Page 290

Aim: To extend 1-figure multipliers to include the 5's and their reverses

Key: **1.** 5 × \$.15 = \$.75. **2.** 5 × \$.10 = \$.50. **3.** 215, 100, 280, 590, \$3.35, \$20.95. **4.** 190, 364, 320, 2860, \$1.60, \$6.30. **5.** 375, 490, 315, 1884, \$4.50, \$16.40.

Pages 291–292

Aim: To teach the division facts of the 5's

Suggestion: Follow the same pattern as suggested for teaching the previous division facts with emphasis on the subtractive nature of division.

Key: Page 291 **1.** 5 groups; 5 nickels; 5. **2.** 5. **3.** 8, 8. **4.** 30 ÷ 5 = 6. **5.** 8, 8. **6.** 4, 4. **7.** 7, 7. **8.** 9, 9. **9.** 3, 1, 4. **10.** 6, 0, 9. **11.** 5, 2, 7. **12.** 30¢ ÷ 5¢ = 6 (nickels). **13.** 40 nuts ÷ 5 = 8 nuts.

Page 292 **1.** 3; 3. **2.** 7; 7. **4.** 5 ÷ 5 = 1, 10 ÷ 5 = 2, 15 ÷ 5 = 3, 20 ÷ 5 = 4, 25 ÷ 5 = 5, 30 ÷ 5 = 6, 35 ÷ 5 = 7, 40 ÷ 5 = 8, 45 ÷ 5 = 9. **5.** The sixth; the ninth. **6.** 8, 1, 7, 9, 5, 3, 6; 8. **7.** 30¢ ÷ 5¢ = 6 (packages). **8.** 25¢ ÷ 5¢ = 5 (sheets). **9.** 35 plants ÷ 5 = 7 plants. **10.** 40¢ ÷ 5¢ = 8 (apples). **11.** 20 ÷ 5 = 4 (cars).

Page 293

Aim: To teach how to find $\frac{1}{5}$ of a number

Suggestion: The work on this page can be oral in nature.

Key: **1.** One half is larger. **2.** One fifth; 2 candies; 2; yes. **3.** 20 dots; 4 dots; 4; 4. **4.** 8¢; 6¢; 1¢. **5.** 35 ÷ 5 = 7 (marbles). **6.** 1, 5, 7, 3. **7.** 4, 8, 2, 6. **8.** 1, 4, 9, 7.

Page 294

Aim: To provide practice in dividing 2-figure and 3-figure numbers by 2, 3, 4, and 5

Key: **1.** 25 cents; 5 nickels. **2.** 20¢ ÷ 5 = 4¢. **3.** 30¢ ÷ 5 = 6¢. **4.** 100 cents; 20 nickels. **5.** 55¢ ÷ 5 = 11¢. **6.** 50¢ ÷ 5 = 10¢. **7.** 40¢ ÷ 5 = 8¢; 5¢; 10¢; \$1. **8.** 15¢ ÷ 5¢ = 3 (cards). **9.** 25¢ ÷ 5¢ = 5 (candy bars). **10.** 11, 40, 81, 30, 60, 21. **11.** 10, 61, 20, 70, 91, 100. **12.** 10, 31, 80, 101, 50, 110. **13.** 42, 111, 90, 41, 201, 71. **14.** 13, 51, 231, 301, 102, 120.

Page 295

Aim: To provide mixed practice in multiplication and division

Key: **1.** 45 ÷ 5 = 9 (nickels). **2.** 20¢ ÷ 4¢ = 5 (pencils). **3.** 50¢ ÷ 5 = 10¢. **4.** $80 ÷ 4 = $20. **5.** 100 cents; 20 nickels. **6.** 116, 348, 492, 798, 864. **7.** 325, 145, 565, 840, 585. **8.** 22, 81, 52, 120. **9.** 10, 81, 60, 101.

Page 296

Aim: To maintain problem-solving ability with everyday problem situations

Suggestion: The problems on this page deal primarily with time and money — the two most important quantitative topics in anyone's life.

Key: **1.** 1 hour 45 minutes. **2.** 1 hour 30 minutes. **3.** 4 : 15. **4.** 3 × 17¢ = 51¢. yes; 100¢ − 51¢ = 49¢. **5.** 60 pounds − 56 pounds = 4 pounds. **6.** 11 weeks. **7.** 77 days. **8.** 8¢ + 4¢ + 10¢ + 3¢ + 4¢ = 29¢; 100¢ − 29¢ = 71¢ change. **9.** $1.58, $1.59, $1.60, $1.70, $1.75, $2.00, $3.00, $4.00, $5.00. **10.** 3; 10.

Page 297

Aim: To encourage pupils to make up problems when certain facts are given

Suggestion: From time to time, this Guide has suggested that pupils make up problems in addition to the ones found in the text. However, this work differs in that facts are given but not questions. Naturally, a variety of suggestions will be made.

Page 298

Aim: To review work in counting and measuring

Key: **7.** 27, 37, 47, 57, 67, 77, 87, 97; 33, 43, 53, 63, 73, 83, 93, 103. **8,** 43, 48, 53, 58, 63, 68, 73, 78, 83, 88, 93, 98; 26, 31, 36, 41, 46, 51, 56, 61. **9.** 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95. **10.** 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. **11.** 50, 45, 40, 35, 30, 25, 20, 15, 10, 5. **13.** 27, 30; 14, 17; 18, 21; 24, 27; 10, 13; 18, 21; 12, 15; 21, 24; 15, 18.

Page 299

Aim: To determine what process should be used in problems without numbers

Suggestion: This type of activity is reserved for the superior pupil. In succeeding grades, more and more of this work will be included. Pupils should be permitted to try this page if time permits, but no attempt should be made to explain the work to the entire class.

Key: **1.** Multiply. **2.** Add. **3.** Subtract. **4.** Divide. **5.** Divide. **6.** Add. **7.** Multiply. **8.** Subtract.

Pages 300–310

Aim: To provide end-of-year tests in specific skills

Suggestions: Nothing is more monotonous than day after day of written arithmetic tests. These pages are designed for use by all the pupils, but it is hoped that *you will vary the testing pattern.* For instance, pages 302, 304, and 305 may be done orally. Parts of other pages may be oral. Some tests should be entirely written, especially those on pages 303, 307, 308, and 310.

Key: Page 300 **2.** 73, 31, 89, 57, 45, 84, 48, 22; adding 5: 72, 30, 88, 56, 44, 83, 47, 21; adding 7: 74, 32, 90, 58, 46, 85, 49, 23; adding 8: 75, 33, 91, 59, 47, 86, 50, 24. **3.** 40, 87, 98, 25, 54, 32, 63, 69; adding 5: 39, 86, 97, 24, 53, 31, 62, 68; adding 7: 41, 88, 99, 26, 55, 33, 64, 70; adding 8: 42, 89, 100, 27, 56, 34, 65, 71. **4.** 62, 78, 24, 43, 61, 71, 90, 55; adding 5: 61, 77, 23, 42, 60, 70, 89, 54; adding 7: 63, 79, 25, 44, 62, 72, 91, 56; adding 8: 64, 80, 26, 45, 63, 73, 92, 57. **5.** 14. **6.** 19. **7.** 21. **8.** 20. **9.** \$8.68. **10.** \$7.18. **11.** \$9.41. **12.** \$6.54. **13.** \$4.82 + \$1.08 + \$2.75 = \$8.65. **14.** 7 + 8 + 2 + 5 = 22 (points). **15.** 182, 133, 150, 211, 149, 165, 167, 207. **16.** 687, 923, 948, 704, 542, 826. **17.** 369, 900, 800, 413, 803, 571.

Page 301 **2.** 83, 32, 24, 60, 41, 85, 49, 58; subtracting 7: 81, 30, 22, 58, 39, 83, 47, 56; subtracting 10: 78, 27, 19, 55, 36, 80, 44, 53. **3.** 68, 11, 77, 92, 16, 34, 73, 89; subtracting 7: 66, 9, 75, 90, 14, 32, 71, 87; subtracting 10: 63, 6, 72, 87, 11, 29, 68, 84. **4.** 37, 65, 46, 29, 63, 90, 8, 35; subtracting 7: 35, 63, 44, 27, 61, 88, 6, 33; subtracting 10: 32, 60, 41, 24, 58, 85, 3, 30. **5.** 82 pounds − 76 pounds = 6 pounds. **6.** 25, 7, 73, 223, 196, 64, \$1.24. **7.** 44, 38, 58, 88, 179, 373, \$.59. **8.** 5, 59, 77, 570, 106, 199, \$3.90. **9.** 54, 31, 65, 223, 80, 647, \$6.98. **10.** 25, 16, 49, 194, 281, 467, \$3.17. **11.** 500 − 364 = 136; 300 − 198 = 102. **12.** 854 − 578 = 276; 251 − 202 = 49. **13.** 678 − 396 = 282; 900 − 443 = 457; 693 − 208 = 485. **14.** \$8.00 − \$6.77 = \$1.23; \$3.57 − \$1.29 = \$2.28.

Page 302 **1.** $\frac{1}{3}$ yard. **2.** 37 ounces. **3.** 40 minutes. **4.** 8 rolls. **5.** $\frac{1}{2}$ pound. **6.** 60. **7.** 2. **8.** 36. **9.** 3. **10.** 8. **11.** 3. **12.** Yard. **13.** Dozen. **14.** Feet. **15.** Hours. **16.** Pint. **17.** Minutes. **18.** Pounds. **19.** Quarts. **20.** Ounces. **21.** Inches.

Page 303 **1.** Divide; 99¢ ÷ 3 = 33¢. **2.** Subtract; 50 cookies − 8 cookies = 42 cookies. **3.** Add; 88 stamps + 50 stamps + 75 stamps = 213 stamps. **4.** Subtract; \$1.00 − \$.13 = \$.87. **5.** Divide; 30¢ ÷ 3¢ = 10 (stamps). **6.** Divide; \$4 ÷ 2 = \$2. **7.** Multiply; 2 × 25 cards = 50 cards. **8.** Subtract; \$1.00 − \$.69 = \$.31. **9.** Multiply; 9 × 12¢ = 108¢ or \$1.08. **10.** Subtract; 75¢ − 55¢ = 20¢.

Page 304 **1.** 70, 80, 90, 100, 110, 120; 35, 45, 55, 65, 75, 85, 95; 165, 170, 175, 180, 185, 190, 195, 200; 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110; 170, 270, 370, 470, 570. **2.** 7 hundreds, 0 tens, 2 ones; 3 thousands, 5 hundreds, 8 tens, 0 ones; 4 thousands, 0 hundreds, 6 tens, 0 ones. **3.** Eight dollars sixty-five cents, four dollars, nine dollars six cents, fifty-seven cents. **4.** $\frac{1}{2}$ of the cake. **5.** 4, 8, 5, 9, 7, 3, 6. **7.** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday; January, February, March, April, May, June, July, August, September, October, November, December. **8.** 8, 3, 5, 9, 7. **9.** 28, 83, 85, 7, 38. **10.** 60, 53, 42, 22, 6. **11.** 31, 89, 99, 22, 18. **12.** 8, 16, 9, 50, 94. **13.** 10 dimes. **15.** 4 quarts. **15.** 12 inches. **16.** 16 ounces. **17.** 2 pints. **18.** 12 things. **19.** 3 feet. **20.** 60 minutes. **21.** Multiply; cents; add. **22.** Subtract; dollars; divide.

Page 305 **1.** 35, 40, 50, $1.00. **2.** 18, 20, 25; 7, 10, 15, 25; 12, 15, 25; 20, 25; 10, 15, 25; 9, 10, 15, 25; 11, 15, 25; 21, 25. **3.** 20, 25, 50, $1.00; 56, 60, 65, 75, $1.00; 37, 40, 50, $1.00; 82, 85, 90, $1.00; 70, 75, $1.00; 48, 50, $1.00; 65, 75, $1.00. **4.** 60¢. **5.** 45¢. **6.** 50¢. **7.** 30¢. **8.** 45¢. **9.** 55¢. **10.** 69¢. **11.** 90¢. **12.** 88¢. **13.** 82¢. **14.** 94¢.

Page 306 **1.** 657. **2.** 301. **3.** IX, X, XI. **4.** $4.84. **5.** 462. **6.** 6 flowers. **7.** 60¢. **8.** 10 dimes. **9.** 30 minutes. **10.** 8 ounces. **11.** 108 inches. **12.** 389, 678, 585, 875, 990, 767, 800, 424, 743, 411, 972, 633. **13.** 315, 509, 154, 328, 13, 70, 418, 197, 717, 389, 242, 67. **14.** 86, 124, 94, 256, 614, 830, 658, 102, 186, 112, 418, 836, 468, 272. **15.** 13, 30, 23, 62, 302, 50, 72, 32, 33, 20, 91, 200, 81, 41, 21, 10, 31, 43, 120, 90, 53.

Page 307 **2.** 32, 48, 30, 76, 84, 174, 118; 48, 72, 45, 114, 126, 261, 177. **3.** 162, 94, 180, 126, 52, 140, 68; 243, 141, 270, 189, 78, 210, 102. **4.** 51, 100, 484, 510, $8.52, $6.72. **5.** 90, 129, 1400, 812, $8.24, $6.56. **6.** 108, 36, 375, 660, $6.45, $8.48. **7.** About 2 yards. **8.** 100 marbles ÷ 2 = 50 marbles. **9.** 7, 20, 53, 53, 60, 70. **10.** 9, 40, 73, 90, 101, 310. **11.** 8, 9, 60, 84, 203, 42. **12.** 21, 33, 43, 62, 303, 231.

Page 308 **1.** 8 × 10¢ = 80¢. **2.** 2 × 15¢ = 30¢; 45¢. **3.** 3 × $.30 = $.90. **4.** 10 rabbits − 3 rabbits = 7 rabbits. **5.** 120 ÷ 3 = 40 (children). **6.** $6.49 − $4.75 = $1.74. **7.** 65¢ + 15¢ = 80¢. **8.** 60¢ ÷ 3 = 20¢. **9.** 25 tickets − 6 tickets = 19 tickets. **10.** $1.75 + $5.00 = $6.75. **11.** $6 ÷ 2 = $3. **12.** 99¢ ÷ 3 = 33¢.

Page 309 **1.** 9 weeks. **2.** 11 weeks − 6 weeks = 5 weeks. **3.** 6 hours. **4.** $25 − $21 = $4. **5.** 9 × $3 = $27. **6.** $60 ÷ 2 = $30. **7.** $30 − $7 = $23.

Page 310 **1.** (See answers for those pages.) **3.** 4 hundreds, 9 tens, 3 ones; 2 thousands, 8 hundreds, 0 tens, 0 ones; 7 thousands, 0 hundreds, 0 tens, 6 ones. **4.** 806. **5.** 327. **6.** 465. **7.** $7.52. **8.** 381. **9.** 818. **10.** 321. **11.** 70. **12.** 6 glasses. **13.** 4 yards. **14.** 32 ounces. **15.** 120. **16.** $2.25. **17.** 20 stamps. **18.** 13 cards. **19.** $.31 change. **20.** 69, 70, 75, $1.00; 69, 70, 80, 90, $1.00.

Pages 311–312

Aim: To provide a ready reference of the basic addition and subtraction facts

Suggestion: The facts are listed on these pages in sequential order so that the pupils may see the relationships which exist among them. Be sure to point out these relationships.

Pages 313–326

Aim: To provide "More Practice" pages

Suggestions: These pages are correlated with certain pages throughout the text. At the bottom of many of the text pages you will find a red circle with a white number that refers to a section of these practice pages.

Key: Page 313 **1.** 67¢; 77¢; 99¢; 89¢; 98¢; 77¢; 76¢. **2.** 96¢; 76¢; 86¢; 58¢; 57¢; 99¢; 95¢. **3.** 87¢; 64¢; 44¢; 69¢; 48¢; 76¢; 49¢. **4.** 96; 96; 58; 78; 87; 49; 85. **5.** 65; 98; 77; 36; 89; 64; 97. **6.** 47; 79; 79; 76; 98; 59; 88. **7.** 63¢; 57¢; 23¢; 21¢; 15¢; 74¢; 22¢. **8.** 21¢; 62¢; 52¢; 16¢; 42¢; 21¢; 22¢. **9.** 51¢; 43¢; 45¢; 33¢; 36¢; 14¢; 33¢. **10.** 41¢; 11¢; 34¢; 25¢; 47¢; 62¢; 31¢.

Page 314 **1.** 46; 43; 31; 32; 34; 15; 28. **2.** 34; 51; 42; 31; 43; 14; 12. **3.** 45; 45; 41; 26; 12; 47; 53. **4.** 51; 22; 42; 71; 27; 26; 31. **5.** 9; 8; 8; 10; 8; 9; 10; 9; 10. **6.** 9; 10; 8; 7; 9; 9; 10; 10; 10. **7.** 149; 118; 177; 158; 108; 106; 128. **8.** 107; 137; 169; 139; 158; 189; 177. **9.** 76; 89; 98; 94; 59; 77; 69. **10.** 105; 106; 65; 126; 136; 155; 174.

Page 315 **1.** 75; 64; 64; 72; 82; 62; 75. **2.** 93; 73; 83; 63; 51; 94; 61. **3.** 63; 77; 66; 81; 82; 72; 57. **4.** 72; 84; 74; 65; 72; 53; 83. **5.** 11; 13; 15; 11; 10; 16; 11; 12; 11. **6.** 12; 10; 14; 13; 14; 15; 13; 16; 15. **7.** 137; 159; 128; 114; 136; 109; 177. **8.** 144; 116; 125; 123; 148; 137; 136. **9.** 179; 156; 108; 137; 155; 126; 119. **10.** 158; 147; 169; 166; 109; 185; 108.

Page 316 **1.** 163; 157; 141; 115; 175; 148; 125. **2.** 148; 108; 117; 125; 107; 119; 126. **3.** 133; 189; 129; 166; 117; 148; 134. **4.** 22; 34; 60; 46; 82; 55; 44. **5.** 77; 91; 91; 54; 92; 61; 30. **6.** 43; 73; 73; 92; 90; 52; 91. **7.** 898; 856; 467; 983; 986; 774. **8.** 969; 869; 937; 599; 879; 648. **9.** 976; 785; 799; 767; 799; 276. **10.** 697; 548; 848; 495; 376; 698.

Page 317 **1.** 13; 13; 12; 13; 11; 11; 11; 11; 11. **2.** 11; 11; 14; 12; 12; 12; 14; 11; 15. **3.** 11; 24; 23; 74; 44; 70; 35. **4.** 35; 51; 52; 21; 92; 81; 68. **5.** 62; 33; 42; 35; 86; 23; 70. **6.** 42; 10; 13; 63; 71; 65; 56. **7.** 335; 418; 652; 420; 322; 321. **8.** 224; 140; 714; 133; 536; 884. **9.** 255; 414; 463; 215; 211; 671. **10.** 320; 525; 132; 331; 104; 116.

Page 318 **1.** 5; 4; 63; 501; 462; 7; 30. **2.** 82; 6; 3; 6; 844; 341; 5. **3.** 2; 45; 1; 303; 513; 40; 5. **4.** 2; 4; 72; 201; 981; 2; 10. **5.** 18; 15; 15; 14; 19; 19; 17; 19; 18. **6.** 18; 19; 19; 19; 16; 16; 19; 18; 19. **7.** 14; 15; 17; 18; 18; 18; 15; 18; 15. **8.** 17; 18; 19; 19; 16; 18; 18; 18; 16. **9.** 17; 19; 16; 14; 19; 19; 18; 18; 17.

Page 319 **1.** 16; 20; 20; 23; 22; 22; 22; 21; 25. **2.** 16; 22; 23; 24; 24; 20; 26; 26; 21. **3.** 21; 23; 25; 22; 20; 24; 26; 23; 21. **4.** 22; 20; 24; 20; 25; 22; 23; 26; 21. **5.** 74; 74; 91; 82; 90; 71; 87; 60. **6.** 44; 65; 61; 84; 91; 85; 92; 93. **7.** 75; 40; 76; 95; 95; 51; 54; 87. **8.** 63; 71; 80; 60; 94; 52; 94; 84.

Page 320 **1.** 120; 103; 124; 100; 132; 106; 153; 125. **2.** 124; 101; 144; 110; 110; 151; 140; 130. **3.** 164; 136; 118; 173; 137; 101; 182; 121. **4.** 142; 155; 120; 110; 140; 162; 105; 153. **5.** 116; 144; 172; 182; 143; 177; 153; 149. **6.** 105; 168;

173; 195; 176; 137; 162; 104. **7.** 174; 124; 145; 166; 196; 167; 192; 180. **8.** 87; 77; 199; 128; 165; 187; 156; 176. **9.** 94; 90; 95; 148; 155; 169; 134; 159.

Page 321 **1.** 92; 94; 70; 91; 80; 60; 86. **2.** 78; 59; 88; 96; 74; 86; 97. **3.** 39¢; 47¢; 8¢; 26¢; 69¢; 18¢; 6¢. **4.** 29¢; 55¢; 37¢; 37¢; 18¢; 54¢; 36¢. **5.** 39¢; 26¢; 14¢; 5¢; 48¢; 28¢; 28¢. **6.** 28; 69; 14; 69; 57; 69; 68. **7.** 5; 15; 27; 68; 84; 72; 89. **8.** 13; 29; 39; 85; 39; 57; 77. **9.** 49; 46; 2; 87; 43; 49; 68. **10.** 35; 36; 15; 44; 78; 96; 61.

Page 322 **1.** 27; 37; 5; 57; 44; 4; 9. **2.** 3; 38; 18; 58; 6; 8; 45. **3.** 9; 65; 8; 2; 28; 7; 18. **4.** $8.67; $8.72; $4.90; $5.94; $5.65; $7.85. **5.** $6.90; $8.83; $5.71; $9.42; $8.32; $3.84. **6.** $9.60; $7.78; $6.60; $5.33; $7.84; $7.92. **7.** $9.29; $8.47; $6.67; $6.59; $9.08; $9.25. **8.** $4.75; $8.14; $8.37; $6.06; $6.28; $4.55. **9.** $9.48; $7.14; $5.38; $9.18; $9.08; $9.25. **10.** $3.65; $7.17; $8.35; $7.03; $8.29; $5.39.

Page 323 **1.** 613; 501; 827; 634; 754; 812. **2.** 658; 521; 731; 924; 406; 923. **3.** 856; 730; 820; 721; 631; 900. **4.** 875; 914; 300; 504; 400; 956. **5.** $1.47; $1.40; $1.31; $1.38; $1.72; $1.34; $1.60. **6.** $1.69; $1.18; $2.06; $1.20; $1.36; $1.42; $1.51. **7.** $7.08; $3.58; $4.29; $1.59; $6.13; $3.06. **8.** $1.26; $2.38; $1.15; $2.14; $2.17; $3.62. **9.** $6.25; $4.48; $4.07; $2.04; $5.16; $5.06. **10.** $.78; $1.27; $5.34; $.07; $4.35; $.36.

Page 324 **1.** $2.42; $1.83; $1.75; $2.95; $4.86; $3.66. **2.** $3.76; $1.42; $2.90; $.74; $2.91; $.67. **3.** $5.82; $1.53; $1.73; $5.95; $3.64; $.54. **4.** 269; 189; 175; 485; 247; 147. **5.** 113; 598; 376; 547; 257; 199. **6.** 196; 238; 368; 358; 489; 69. **7.** 434; 644; 259; 527; 47; 166. **8.** 54; 389; 136; 105; 228; 169. **9.** 537; 358; 475; 17; 309; 474. **10.** 247; 336; 423; 278; 112; 234.

Page 325 **1.** 85; 33; 24; 779; 235; 318. **2.** 7; 70; 68; 599; 312; 444. **3.** 65; 8; 69; 896; 448; 257. **4.** 48; 66; 84; 22; 264; 228; 464. **5.** 86; 44; 26; 88; 862; 624; 868. **6.** 64; 82; 46; 68; 486; 824; 682. **7.** 654; 296; 872; 600; 972; 638. **8.** 470; 812; 381; 612; 378; 818. **9.** 784; 918; 654; 565; 414; 327. **10.** 1236; 2721; 1245; 1438; 1624; 1554.

Page 326 **1.** 116; 284; 144; 376; 468; 820. **2.** 208; 72; 180; 240; 496; 852. **3.** 126; 294; 120; 332; 624; 464. **4.** 148; 356; 300; 344; 1632; 2064. **5.** 21; 50; 111; 72; 40; 81. **6.** 10; 90; 201; 120; 82; 210. **7.** 22; 112; 61; 31; 42; 91. **8.** 11; 100; 70; 92; 32; 110. **9.** 305; 95; 115; 370; 545; 2065. **10.** 185; 200; 430; 260; 575; 1025. **11.** 140; 357; 225; 300; 840; 570. **12.** 435; 475; 315; 120; 3085; 1545.

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Let's Measure: Inches, Feet, Yards

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Let's Measure: Pints, Quarts, and Gallons

Place Value: Ones, Tens, Hundreds

Let's Count
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Subtraction Is Easy
What Time Is It?
Making Change for a Dollar

Encyclopaedia Britannica Films, Inc., 1150 Wilmette Avenue, Wilmette, Illinois

The Number System
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The Meaning of Plus and Minus

Teaching Film Custodians, Inc., 25 West 43 Street, New York 36, New York

Borrowing in Subtraction

Text-Film Department, McGraw-Hill Book Company, 330 West 42 Street, New York 36, New York

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Wayne University, Audio-Visual Materials Bureau, 438 W. Ferry Street, Detroit 2, Michigan

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Addition Combinations
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K102 — *Pattern Boards* (Chap. 1–6)
K103 — *Additive Sticks* (Chap. 1–7)
K104 — *Ten Ten Board* (Chap. 1–7)
K105 — *Number Line* (Chap. 1–7)
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K110 — *Numerals and Relations* (Chap. 1–4, 6, 7)
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K112 — *Base and Place* (Chap. 2–8)
K115 — *Simple Fractions* (Chap. 3, 7, 8)
K117 — *Advanced Fractions* (Chap. 3)
K120 — *Linear Measurement* (Chap. 4–6)

Notes

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